

**The Document for Accreditation**

**for the Program**

**B.Tech in  
Civil Engineering**

**Department of Civil Engineering  
Visvesvaraya National Institute of  
Technology  
Nagpur 440010, (MS) India**

# **NATIONAL BOARD OF ACCREDITATION**

## **SELF ASSESSMENT REPORT (SAR) FOR ACCREDITATION OF UG ENGINEERING PROGRAMMES (TIER-I)**



**NATIONAL BOARD OF ACCREDITATION**

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**(January, 2013)**

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# Self Assessment Report (SAR) UG

## Part A

### I. Institutional Information

#### I.1. Name and address of the institution and affiliating university:

VISVESVARAYA NATIONAL INSTITUTE OF TECHNOLOGY (VNIT),  
SOUTH AMBAZARI ROAD, NAGPUR 440010

#### I.2. Name, designation, telephone number, and e-mail address of the contact person for the NBA:

Dr. Narendra S. Chaudhari, Director VNIT.

Ph :

Email : [director@vnit.ac.in](mailto:director@vnit.ac.in)

Dr. K D Kulat, Professor, Department of Electronics Engineering

Ph : 0712-2801345

Email : [kdkulat@ece.vnit.ac.in](mailto:kdkulat@ece.vnit.ac.in) / [kishor\\_kulat@yahoo.com](mailto:kishor_kulat@yahoo.com)

#### I.3. History of the institution (including the date of introduction and number of seats of various programmes of study along with the NBA accreditation, if any) in a tabular form:

##### 1.3.1 Historical Background

The VNIT, Nagpur is one of the thirty National Institutes of Technology in the country. The Central Government by Act of Parliament (National Institutes of Technology Act, 2007 (29 of 2007)) declared VNIT Nagpur as an Institute of National Importance. The Act was brought into force from 15<sup>th</sup> August 2007.

VNIT Nagpur was conferred the Deemed to be University status (under University Grants Commission Act, 1956 (3 of 1956)) with effect from 26<sup>th</sup> June 2002 by the Central Government.

Earlier, the Institute was known as Visvesvaraya Regional College of Engineering (VRCE). It was established in the year 1960 under the scheme sponsored by Government of India and Government of Maharashtra. The college was started in June 1960 by amalgamating the State Government Engineering College functioning at

Nagpur since July 1956. In the meeting held in October 1962, the Governing Board of the college resolved to name it after the eminent engineer, planner, and statesman of the country Sir M. Visvesvaraya.

### **1.3.2 Location**

Nagpur known as Orange City is centrally located and well-connected to all the parts of the country by air, rail and road. It is also the second capital of Maharashtra. Nagpur is the largest city in central India and the winter capital of the state of Maharashtra. It is a fast growing metropolis and is the third most populous city in Maharashtra after Mumbai and Pune, and also one of the country's most industrialized cities. With a population of 2,405,421,<sup>[5]</sup> Nagpur is the 13<sup>th</sup> most populous city and 13<sup>th</sup> largest urban agglomeration in India. It is the 154<sup>th</sup> largest agglomeration and 164<sup>th</sup> largest contiguous urban areas in the world.

Nagpur is the seat of the annual winter session of the Maharashtra state assembly, Vidhan Sabha". Nagpur is a major commercial and political centre of the Vidarbha region of Maharashtra. In addition, the city derives political importance from being the headquarters for the Hindu nationalist organisation RSS and an important location for the Dalit Buddhist movement.

According to a survey by ABP News-Ipsos, Nagpur has been identified as the best city in India by topping the liveability, greenery, public transport, and health care indices.<sup>[9][10][11]</sup> It is famous for the Nagpur Orange and is known as the "Orange City" for being a major trade center of oranges cultivated in the region.

The city was founded by the Gonds and later became a part of the Maratha Empire under the royal Bhonsale dynasty. The British East India Company took over Nagpur in the 19<sup>th</sup> century and made it the capital of the Central Provinces and Berar. After the first reorganisation of states, the city lost its status as the capital. Following the informal "Nagpur Pact" between political leaders, it was made the second capital of Maharashtra.

Nagpur is also called the "Tiger Capital of India"<sup>[13][14]</sup> as it connects many tiger reserves in India to the world. It is among the important cities for the Information Technology Sector in Maharashtra. Nagpur lies at the dead center of the country with the Zero Mile marker indicating the geographical center of India. City of Nagpur is considered as geographic centre of India with its famous Zero Mile stone. Major National highways and rail networks connecting Delhi with Hyderabad/ Bangalore/ Kanyakumari and Mumbai with Kolkata pass through the city. It is now recognized as Tiger Capital of India with major Tiger National parks around the city. It is popularly known as "Orange City". Nagpur is second capital of Maharashtra State.

VNIT is located in the heart of Nagpur city on sprawling campus of 214 acres. The campus can be located on Google maps as VNIT, N 21° 7' 28", E 79° 3' 8". The official website address for VNIT is: [www.vnit.ac.in](http://www.vnit.ac.in).

### 1.3.3 Regular Academic Programmes:

#### Academic Programmes

The Institute offers 9 Under-Graduate programs viz., B. Tech. in Chemical, Civil, Computer Science, Electrical and Electronics, Electronics and Communication, Mechanical, Metallurgical and Materials and Mining Engineering and Bachelor of Architecture.

The Institute also offers 16 Post-Graduate Full time programs (2 years duration) viz., M. Tech. in Industrial Engg., Heat Power Engg, CAD-CAM, Materials Engg, VLSI Design, Communication System Engineering, Computer Science Engg., Industrial Engg., Integrated Power System, Power Electronics and Drives, Structural Engineering, Structural Dynamics and Earthquake Engineering, Environmental Engineering, Water Resources Engineering., Construction Technology and Management, Transportation Engineering and Urban Planning. The Institute also offers M.Tech. by research program in all engineering departments, Ph D (Full/Part Time).

Institute has started M.Sc. programs in Chemistry, Mathematics and Physics from current year.

The Doctoral Research is done in all Engineering and Sciences departments. Institute is a recognized centre under QIP scheme for Ph.D. program in Electrical and Metallurgical & Materials Engineering department and for M. Tech. program in Electrical and Civil Engineering departments.

Sr.No.	Program Name	Year	Intake Capacity
<b>Under Graduate Program : B. Arch/B. Tech.</b>			
01.	Architecture	1960	62
02.	Chemical Engineering	2006	92
03.	Civil Engineering	1956	92
04.	Computer Science Engg.	1987	92
05.	Electronics and Communication Engineering	1980	92
06.	Electrical And Electronics	1960	92
07.	Mechanical Engineering	1960	92
08.	Metal and Materials Engineering	1965	92
09.	Mining Engineering	1982	32
	<b>TOTAL</b>		<b>738</b>

<b><u>Post Graduate &amp; Research Programs :</u></b>			
<b><u>M. Tech.</u></b>			
01.	Environmental Engineering	1966	20
02.	Water Resources Engineering	2011	20
03.	Construction Technology	2010	20
04.	Transportation Engineering	2011	20
05.	VLSI Design	2007	20
06.	Communication System Engineering	2012	20
07.	Computer Science Engineering	2007	20
08.	Industrial Engineering	1989	20
09.	Heat Power Engineering	2002	20
10.	CAD-CAM	2010	20
11.	Integrated Power System	1968	20
12.	Power Electronics & Drives	2010	20+5 SP
13.	Material Engineering	1960	20
14.	Structural Dynamics and Earthquake Engineering	2003	20
15.	Structural Engineering	1991	20
16.	Exavation Engineering	2012	
17.	Urban Planning	1988	20
	<b>TOTAL</b>		<b>320</b>
<b><u>M Sc.</u></b>			
01.	M Sc Chemistry	2013	20
02.	M Sc Mathematics	2013	20
03.	M Sc Physics	2013	20
	<b>TOTAL</b>		<b>60</b>

#### **1.3.4 Accreditation Status:**

National Board of Accreditation granted accreditation to the various eligible programs in 2009 wide letter No. F.No. NBA/ACCR-44 (II)/2002, Dated 2<sup>nd</sup> March 2009. The details are given below:

The Accreditation Status of the programme(s) are:

Sr.No	Name of UG & PG Programme(s)	Accreditation Status	Period of validity w.e.f. 10.02.2009
01.	B.Tech. Electronics & Comm. Engg.	Accredited	3 Years
02.	B.Tech. Mechanical Engg.	Accredited	3 Years
03.	B.Tech. Civil Engg.	Accredited	3 Years
04.	B.Tech. Computer Science & Engg.	Accredited	3 Years
05.	B.Tech. Mining Engg.	Accredited	5 Years
06.	B.Tech. Metallurgical & Materials	Accredited	5 Years

	Engg.		
07.	B.Tech. Electrical & Electronics Engg.	Accredited	5 Years
08.	M.Tech. Integrated power System	Accredited	3 Years
09.	M.Tech. Structural Dynamics & Earth Quate Engg.	Accredited	3 Years
10.	M.Tech. Environmental Engg.	Accredited	3 Years
11.	M.Tech. Structural Engg.	Accredited	3 Years
12.	M.Tech. VLSI Design	Accredited	3 Years
13.	M.Tech. Industrial Engg.	Accredited	3 Years
14.	M.Tech. Ferrous Process Metallurgy	WITHDRAWN WITHDRAWN	
15.	M.Tech. Ferrous Process Metallurgy		

(Total number of programmes Accredited vide this letter – Twelve and Withdrawn – Two)

### **New M.Tech Programs started (year)**

Sr.No.	Title of Program	Intake
01.	Transportation Engineering (2011)	20
02.	Communication System Engineering (2012)	20
03.	Water Resources Engineering (2011)	20
	<b>Total Increased Intake</b>	<b>60</b>

### **Campus**





VNIT Campus is spread over an area of 214 acres near Ambazari lake. It presents a panorama of harmony in architecture and natural beauty. The campus has been organized in three functional sectors;

- Hostels for students, Health centre, sports complex
- Academic Buildings, Administrative Building, and Library
- Residential Sector for family & staff

The academic buildings are located fairly in close proximate, to the hostels and the staff quarters. The campus has a full-fledged computerized branch of State Bank of India with ATM facility, Canara Bank, Post office as well as courier services and other needs of students, residents and office are nearby. .

The Institute has its own fully fledged Health Center with a full time residential Medical Officer. The specialized medical services of a Psychological Counsellor, Dietician, Physiotherapist, Pathology lab, Yoga centre, and also medical consultants in Ayurveda and Homeopathy are available. Patients suffering from serious illness / requiring intensive care are referred to the Govt. Medical College and Hospital and other Health care centres duly approved under the CGHS. A full time dedicated Ambulance service in available at the dispensary.

Spacious and multicuisine canteen is located close to the instruction zone and hostels. Two more cafeterias exist on the campus. The Institute has a well equipped Gymkhana apart from various playgrounds for Tennis, Badminton, VolleyBall, Foot Ball, Hockey, and Cricket. NCC unit is also located on campus. There are very well used by students and campus residents of quarters.

**1.4. Ownership status: Govt. (central/state) / trust / society  
(Govt./NGO/private)/private/other:**

**CENTERAL GOVT. MHRD**

**Declared as Institute of National Importance by NIT Act of 2007 (27 of 2007)**

**1.5. Mission and Vision of the Institution:**

**Mission**

The Mission of VNIT is to achieve high standards of excellence in generating and propagating knowledge in engineering and allied disciplines. V.N.I.T. is committed to providing an education that combines rigorous academics with joy of discovery. The Institute encourages its community to engage in a dialogue with society to be able to effectively contribute for the betterment of humankind.

**Vision**

To contribute effectively to the national endeavour of producing quality human resource of world class standard by developing a sustainable technical education system to meet the changing technological needs of the Country, incorporating relevant social concerns and to build an environment to create and propagate innovative technologies for the economic development of the Nation.

## **I.6. Organisational Structure:**

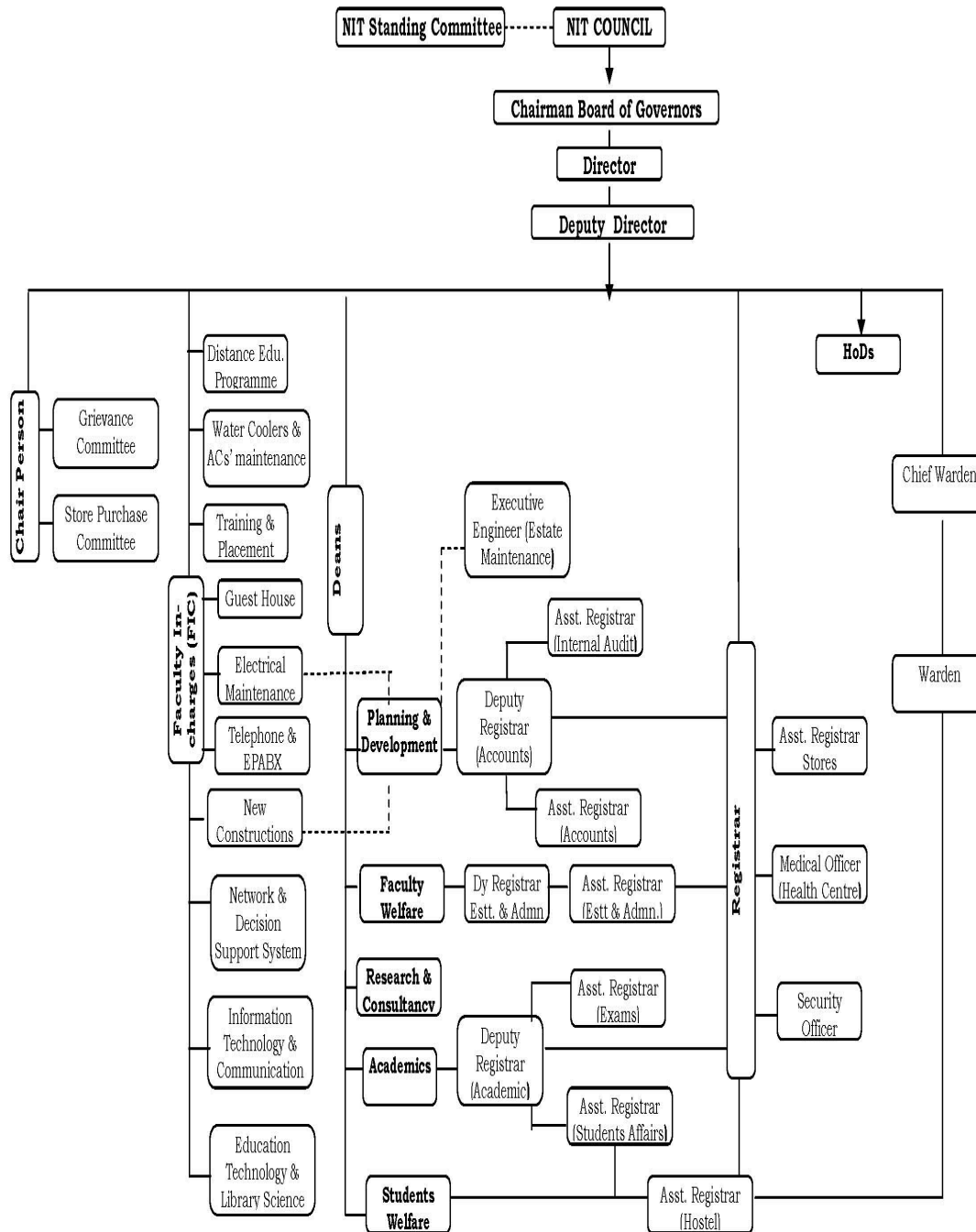
### **1.6.1 Administration**

As per the provisions of the NIT Act, the Board of Governors (BoG) is responsible for superintendence, direction, and control of the Institute. Thus, the BoG is vested with full powers of the affairs of administration / management and finances of the Institute. Members of the Board represent Government of India, Government of Maharashtra, Industries, and faculty of the Institute. The Director is the principal academic and executive officer of the Institute. Besides the BoG, the Senate, the Finance Committee (FC) and the Building and Works Committee (BWC) are statutory committees and therefore, authorities of the Institute.

Apart from the above statutory committees, the Board has the power to constitute various sub-committees for smooth and efficient administration. Thus, the Board has constituted the Stores Purchase Committee (SPC), Grievance Committee (GC), and Special Cell. The SPC administers the centralized procurement of equipment and material whereas the GC provides a platform to hear the views of staff and faculty on grievances. The Special Cell functions to protect the interest of backward-class candidates through procedural, institutional, and other safeguards.

## 1.6.2 Flow Chart showing Institutional Administration

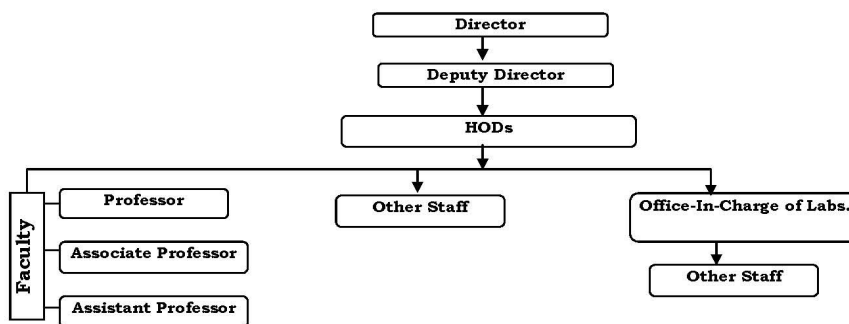
Figure - 1



### 1.6.3 Flow Chart showing the hierarchy of Academic Departments

Figure - 2

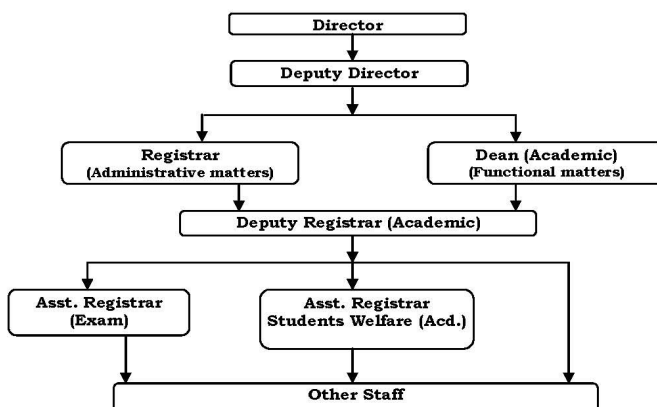
#### 1. ACADEMIC DEPARTMENTS



	Reporting Officer	Reviewing Officer
Professor	Director	Director
Associate Professor / Assistant Professor	HoD	Director
Group – A other than above	HoD	Deputy Director/ Director
Group – C/Other Staff	Lab-In-Charge / HoD	HoD

- Note:** i) In case Associate Professor is HoD, Director shall also be Reporting Officer for all the Associate Professor in that Departments.  
 ii) In case, Assistant Professor is HoD, Director shall also be Reporting Officer for all faculty.

#### 2. ACADEMIC SECTION



	Reporting Officer	Reviewing Officer
Group – A	Registrar *	Deputy Director /Director
Group – C/Other Staff	Section Head	Registrar

\* In consultation with Dean (Academic)

**I.7. Financial status: Govt. (central/state) / grants-in-aid / not-for-profit / private self- financing / other:**

(Instruction: Financial status of the institute has to be mentioned here.)

**CFI (Centrally funded institution)**

**I.8. Nature of the trust/society:**

Also list other institutions/colleges run by the trust/society

(Instruction: Way of functioning and activities of the trust/society have to be listed here.)

Name of the Institution	Year of establishment	Location
NA	-	-

**I.9. External sources of funds:**

(Rs. in Lacs)

Name of the External Source	CFY 2013-14	CFYm1 2012-13 *	CFYm2 2011-12	CFYm3 2010-11
Plan	3825=00	00	7500=00	2200=00
Non Plan	1620=00	3200=00	4249=00	1500=00

(Instruction: The different sources of the external funds over the last three financial years are to be listed here.)

\* No funds under plan were received.

**I.10 Internally acquired funds:**

(In Rupees)

Name of the Internall Source	CFY	CFYm1 2010-11	CFYm2 2011-12	CFYm3 2012-13
Students' fee	2,70,14,268	8,62,01,169	100,32,5,522	17,79,67,064
Interest & Other Income	4,88,21,680	8,16,88,699	5,63,25,522	3,23,85,087

(Instruction: The different sources of the internal funds over the last three financial years are to be listed here.)

## **I.11 Scholarships or any other financial assistance provided to students?**

VNIT Nagpur is making available to its students and research scholars several avenues for receiving assistance towards scholarships, free ships etc. some of the several scholarships available to VNIT students are :

- [1] Indian Oil Corporation Scholarship, Indian Oil Corporation has announced 2600 Scholarships for students of 10+/ITI, MBBS, Engineering & MBA on merit basis.
- [2] NTPC Scholarship, NTPC is offering 35 scholarships to students belonging to SC/ST/PC categories persons who are pursuing 4 years full time degree course in engineering on a competitive basis for applicant from NIT.
- [3] ONGC Engineering Scholarships ONGC offers 75 Scholarships for SC/ST students who are pursuing higher education in Engineering, Geology, Geophysics and MBA.
- [4] GATE stipend for qualified post graduate students.
- [5] AICTE PG Scholarship 2013 for M.E./M.Tech/M.Pharma Students AICTE PG Scholarship 2013 for M.E./M.Tech/M.Pharma second year students.
- [6] AICTE Scholarships for GATE Qualified Candidates 2013 For GATE Qualified Candidates 2013 for M.E./M.Tech/ second year students.
- [7] Cargill Global Scholarships Program for Undergraduate Students 2013 Cargill Global Scholarships Program for Undergraduate Students 2013 is the global scholarship program for India, Brazil, Russia, China and the USA countries.
- [8] North South Foundation Scholarships 2014 (NSF) Scholarships 2014 for those doing BE/BTech.
- [9] NATIONWIDE EDUCATION AND SCHOLARSHIP TEST (N.E.S.T.) 2013 Natinalwide education and scholarship test (n.e.s.t.) 2013 For Degree Students Of Science Engg. Courses.
- [10] Scholarship for Physically Handicapped Students National Handicapped Finance and Development Corporation (NHFDC).
- [11] MOMA scholarship – Annually government of India offers 20000 scholarships that distributed among the students of minority communities throughout the country, to eligible students from this institute.
- [12] State Government Scholarships from Social Welfare Department for eligible students from this institute.

The aggregate amount of Scholarship amount in (Rs.) year wise is indicated below :

Details	CFY	CFYm1	CFYm2	CFYm3
Category				
Scholarship Assistance	Various sources given in I.11			
Amount	3,28,05,922	1,74,86,164	1,77,64,254	2,37,27,156

### I.12 Basis/criterion for admission to the institution:

**All India entrance** / state- level entrance / university entrance /12th standard mark sheet / others:

(Instruction: The basis/criterion for student intake has to be listed here.)

### I.13 Total number of engineering students:

	CFY 2012-13	CFYm1 2011-12	CFYm2 2010-11	CFYm3 2009-10
Total no. of boys	2868	2636	2398	2142
Total no. of girls	708	583	500	457
Total no. of students	3576	3219	2898	2599

Total number of other students, if any

(Instruction: Total number of engineering students, both boys and girls, has to be listed here. The data may be categorised in a tabular form under graduate or post graduate engineering, or other programme, if applicable.)

### I.14 Total number of employees:

(Instruction: Total number of employees, both men and women, has to be listed here. The data may be categorised in a tabular form as teaching and supporting staff.)

Minimum and maximum number of staff on roll in the engineering institution, during the CAY and the previous CAYs (1st July to 30th June):

**A. Regular Staff**

Items	GENDER	CAY		CAYm1		CAYm2		CAYm3	
		Min	Max	Min	Max	Min	Max	Min	Max
Teaching staff in engineering	M		131		122		123		119
	F		23		20		20		19
Teaching staff in sciences & humanities Physical Edu.	M		24		15		17		16
	F		7		7		7		7
Non teaching staff	M		9		10		10		12
	F		3		3		3		3

**B. Contract Staff**

Items	GENDER	CAY		CAYm1		CAYm2		CAYm3	
		Min	Max	Min	Max	Min	Max	Min	Max
Teaching staff in engineering	M	00	01	00	01	00	02	00	00
	F	00	00	00	00	00	00	00	00
Teaching staff in sciences & humanities	M	00	01	00	00	00	00	00	00
	F	00	00	00	00	00	00	00	00
Non teaching staff	M	00	73	00	75	00	77	00	76
	F	00	19	00	19	00	19	00	19

**End of Part A I Institutional Information**



## II. Departmental Information

II.1. Name and address of the department:

**Civil Engineering Department  
Visvesvaraya National Institute of Technology, Nagpur  
South Ambazari Road, Nagpur, Maharashtra - 440010**

II.2. Name, designation, telephone number, and e-mail address of the contact person for the NBA:

**Dr. A.R. Tembhurkar  
Head,  
Telephone No. 0712-2801371, 09850363905  
artembhurkar@civ.vnit.ac.in**

II.3. History of the department including date of introduction and number of seats of various programmes of study along with the NBA accreditation, if any:

Civil Engineering Department is the oldest department in this institute right from the establishment of Government College of Engineering in Nagpur 1956. The department offers the undergraduate course of B.Tech in Civil Engineering and Four Postgraduate Courses of M.Tech as given below.

<b>Program</b>	<b>Description</b>
<b>UG in Civil Engineering</b>	Started with 60 seats in 1956 Intake increased to 71 in 2008 Intake increase to 82 in 2009 Intake increase to 92 in 2010
<b>PG in Civil Engineering Department</b>	
1. Environmental Engineering	Started in 1966 (32 seats )
2. Water Resources Engineering	Started in 2005 (20 seats )
3. Construction Technology	Started in 2010 (20 seats )
4. Transportation Engineering	Started in 2012 (20 seats )

The Courses in the Department of Civil Engineering were accredited in 2001 and 2008.

## II.4. Mission and Vision of the Department

### VISION:

To contribute effectively to the National Endeavour of producing quality human resource of world class standard in civil engineering by developing a sustainable technical education system to meet the changing technological needs of the Country incorporating relevant of social concerns and to build an environment to create and propagate innovative technologies for the economic development of Nation.

### MISSION:

The Mission of the undergraduate civil engineering program is to develop students into capable civil engineering graduates by imparting appropriate high quality education in Civil Engineering so that they could be readily adapted by the service sector to meet the challenges faced by the Nation. The program strives for excellence in engineering education and profession. It also aims to promote all round development of the personality of students by suitably involving them in Co-curricular and extra-curricular activities.

### II.5. List of the programmes/ departments which share human resources and/or the facilities of this programmes/ departments (in %):

(Instruction: The institution needs to mention the different programmes being run in the department which share the human resources and facilities with this department/programme being accredited.)

S.No	Name of the Programme	Human resource Share in %	Facilities (Laboratory/Library/Internet) share in %
1.	UG	15% Shared by Dept of Applied Mechanics	10% Shared by Dept of Applied Mechanics
2.	PG	5% (Mathematics Department)	0%

### II.6. Total number of students:

UG:  $92 \times 3 = 276$  students at any time in the department

PG:  $20 \times 8 = 160$  students at any time in the department

### II.7. Minimum and maximum number of staff on roll during the current and three previous academic years (1st July to 30th June) in the department:

Items	CAY		CAYm1		CAYm2	
	Min	Max	Min	Max	Min	Max
Teaching Faculty with the Program	17	18	16	18	15	16
Non teaching Staff	6	6	6	6	7	7
Total	23	24	22	24	22	23

II.7.1. Summary of budget for the CFY and the actual expenditure incurred in the CFYm1, CFYm2 and CFYm3 (for the Department):

<b>Items</b>	<b>Budget in CFY</b>	<b>Actual expenses in CFY *</b>	<b>Budgeted in CFYm1</b>	<b>Actual Expenses in CFYm1 *</b>	<b>Budgeted in CFYm2</b>	<b>Actual Expenses in CFYm2 *</b>
	Budgeted in 2012-13 in INR	Actual expenses in 2012-13 in INR	Budgeted in 2011-2012 in INR	Actual Expenses in 2011-2012	Budgeted in 2010-2011	Actual Expenses In 2010-2011
Laboratory Equipments	20 lacs	1902851	20 lacs	2278164	18 lacs	1723760
Software purchase	40 lacs	3846628	5 lacs	490819	2 lacs	206000
Laboratory consumables	6 lacs	654252	1 lacs	49297	1 lacs	116620
Maintenance and spares	1 lacs	-	1 lacs	88258	1 lacs	79888
Travel	0 lacs		0 lacs		0 lacs	
Miscellaneous expenses for academic activities	10 lacs	1236184	1 lacs		0.5 lacs	
<b>Total</b>	<b>77 lacs</b>	<b>7639915</b>	<b>28 lacs</b>	<b>2906538</b>	<b>22.5 lacs</b>	<b>2126268</b>

\* The amounts shown under expenditure does not include many items of routine expenses met from Centralised Institutional Source 'such as AMC/Computer consumables and student related travel expenditure which, however, are aggregated in The Institutional Income Expenditure Statement in Part I item I-10

### III. Programme Specific information

III.1. Name of the Programme

#### **UG in Civil Engineering**

(List name of the programme, as it appears on the graduate's certificate and transcript, and abbreviation used for the programme.)

III.2. Title of the Degree

(List name of the degree title, as it appears on the graduate's certificate and transcript, and abbreviation used for the degree.)

#### **Bachelor of Technology in Civil Engineering**

III.3. Name, designation, telephone number, and e-mail address of the

Programme coordinator for the NBA:

**Dr. A.R. Tembhurkar**

**Head,**

**Telephone No. 0712-2801371, 09850363905**

**artembhurkar@civ.vnit.ac.in**

III.4. History of the programme along with the NBA accreditation, if any:

<b>Program</b>	<b>Description</b>
UG in Civil Engineering	Started with 60 seats in 1956 Intake increased to 71 in 2008 Intake increase to 82 in 2009 Intake increase to 92 in 2010

The Courses in the Department of Civil Engineering were accredited in 2001 and 2008.

III.5. Deficiencies, weaknesses/concerns from previous accreditations:

1. GoI has not yet (even after 6 years) approved statutes for VNIT.
2. There are no hostels for M.Tech and Ph.D male students.
3. Only 50% of the faculty has PhD degrees.
4. Although faculty is encouraged to register for PhD, the registration being largely in VNIT, it will lead to inbreeding of faculty. Also, the number of PG and research students is rather small.
5. Only senior faculty is involved in research and publishes reasonably good papers. Overall no of PhDs produced and no of publications are not good enough for an NIT.
6. A lot of obsolete and useless equipments is lying in various departments.

III.6. Total number of students in the programme:

**B.Tech. : 92 X 3= 276 students at any time in the department**

III.7. Minimum and maximum number of staff for the current and three previous academic years (1st July to 30th June) in the programme:

Items	CAY		CAYm1		CAYm2	
	Min	Max	Min	Max	Min	Max
Teaching Faculty with the Program	17	18	16	18	15	16-
Non teaching Staff	6	6	6	6	7	7
Total	23	24	22	24	22	23

III.8. Summary of budget for the CFY and the actual expenditure incurred in the CFYm1, CFYm2 and CFYm3 (exclusively for this programme in the department):

Items	Budget in CFY	Actual expenses in CFY *	Budgeted in CFYm1	Actual Expenses in CFYm1 *	Budgeted in CFYm2	Actual Expenses in CFYm2
	Budgeted in 2012-13 in INR	Actual expenses in 2012-13 in INR	Budgeted in 2011-2012 in INR	Actual Expenses in 2011-2012	Budgeted in 2010-2011	Actual Expenses In 2010-2011
Laboratory Equipments	20 lacs	1902851	20 lacs	2278164	18 lacs	1723760
Software purchase	40 lacs	3846628	5 lacs	490819	2 lacs	206000
Laboratory consumables	6 lacs	654252	1 lacs	49297	1 lacs	116620
Maintenance and spares	1 lacs	-	1 lacs	88258	1 lacs	79888
Travel	0 lacs		0 lacs		0 lacs	
Miscellaneous expenses for academic activities	10 lacs	1236184	1 lacs		0.5 lacs	
Total	77 lacs	7639915	28 lacs	2906538	22.5 lacs	2126268

## **PART B**

### **1. Vision, Mission and Programme Educational Objectives (100)**

#### **1.1. Vision and Mission (5)**

- 1.1.1. State the Vision and Mission of the institute and department (1)

#### **Vision**

To contribute effectively to the National Endeavour of producing quality human resource of world class standard in civil engineering by developing a sustainable technical education system to meet the changing technological needs of the Country incorporating relevant of social concerns and to build an environment to create and propagate innovative technologies for the economic development of Nation.

#### **Mission**

The Mission of the undergraduate civil engineering program is to develop students into capable civil engineering graduates by imparting appropriate high quality education in Civil Engineering so that they could be readily adapted by the service sector to meet the challenges faced by the Nation. The program strives for excellence in engineering education and profession. It also aims to promote all round development of the personality of students by suitably involving them in Co-curricular and extra-curricular activities.

(List and articulate the vision and mission statements of the institute and department)

- 1.1.2. Indicate how and where the Vision and Mission are published and disseminated (2)

Head of the Department's Office  
Departmental corridor  
Departmental Brochure  
Institute website/Departmental web site

(Describe in which media (e.g. websites, curricula books) the vision and mission are published and how these are disseminated among stakeholders)

- 1.1.3. Mention the process for defining Vision and Mission of the department (2)

The vision and mission of the "Civil Engineering Department" are in line with the institute vision and mission. These were defined keeping in view

the priorities of the MHRD. These points were discussed in the departmental meeting and vision and mission statements were finalised.

(Articulate the process involved in defining the vision and mission of the department from the vision and mission of the institute.)

## **1.2. Programme Educational Objectives (15)**

### 1.2.1 Describe the Programme Educational Objectives (PEOs) (2)

The Civil Engineering program will produce graduates that, within a few years of graduation, will

1. Actively engage in problem solving using engineering principles to address the evolving needs of the society
2. be able to succeed in positions in civil engineering practice or research, and in other fields they choose to pursue and enroll in advanced studies
3. Make ethical decisions and demonstrate a commitment to service to the profession and society.
4. Acquire a position or degree that values adaptability and innovation in their work.
5. Pursue lifelong learning, and to be leaders, both in their chosen profession and in other activities.

### 1.2.2. State how and where the PEOs are published and disseminated (2)

(Describe in which media (e.g. websites, curricula books) the PEOs are published and how these are disseminated among stakeholders)

The display of PEOs is at following locations;

- Departmental Brochure
- Institute website/Departmental web site

### 1.2.3. List the stakeholders of the programme (1)

1. Students
2. Parents
3. Society
4. Academia
5. Infrastructure related companies and utilities
6. Research Organisations such as: CSIR, NEERI, CRRI, RRSC, MRSAC, IWPRS, MERI.
7. Public Sector Industries such as: CPWD, MJP, VIDC, PWD, NMC. NIT, NHAI, NTPC, WCL, MSPGCL.

(List stakeholders of the programme under consideration for accreditation and articulate their relevance)

1.2.4. State the process for establishing the PEOs (5)

(Describe the process that periodically documents and demonstrates that the PEOs are based on the needs of the programme’s various stakeholders. )

1. Frequent departmental meeting
2. Meeting with expert from Institute of excellence for quality improvement.
3. Class Committees with participation of students and their feedback
4. Peer review of the departmental academic activity

1.2.5. Establish consistency of the PEOs with the Mission of the institute (5)

(Describe how the Programme Educational Objectives are consistent with the Mission of the department.)

PEOs	Mission				
	1. Actively engage in problem solving	2. be able to succeed in positions in civil engineering practice or research	3. Make ethical decisions and demonstrate a commitment to service	4. Acquire a position or degree that values adaptability and innovation	5. Pursue lifelong learning, and to be leaders, both in their chosen profession
1.	x	x			x
2.	x	x	x		x
3.		x	x		x
4.		x	x	x	
5.	x	x	x	x	

The departmental mission is consistently followed by reviewing objectives and deliverables through departmental meeting, mentor’s suggestion, student feedback



### 1.3. Achievement of Programme Educational Objectives (30)

#### 1.3.1. Justify the academic factors involved in achievement of the PEOs (15)

(Describe the broad curricular components that contribute towards the attainment of the Programme Educational Objectives.)

Achievements of the PEO's are judged to measure the avenues for further improvements in the program educational objectives. The various factors involved in the achievement of the PEO's are as below:

- The curriculum is one of the main tools to prepare students in achieving PEOs. Therefore, the relevance of the courses in the program specific curriculum to PEO needs be quantified in order to establish their level of support to PEO. The broad curriculum is based on making students understand Civil Engineering fundamentals, designs of structures and systems, their operations, analysis, control and management.
- Direct Assessment Procedures: The grades allotted to the students in the continuous mode as well as in the end term exam are one of the indicators of the attainment of PEO's. Grades indicate the level of understanding of the students and hence achievements of the educational objectives.
- Indirect assessment of the student learning is dependent on various other procedures objected towards collecting information regarding the achievement of PEO's viz., Satisfaction surveys conducted on current students ( Feed Backs), class committee meetings wherein discussion regarding the course and course assessment is done,satisfaction surveys conducted amongst passout students and alumni. Apart from this inputs are taken indirectly from the user departments and the current practices are included in the teaching laerning process in relevent courses.
- This is further more integrated with relevant practical sessions, experts/guests seminars, projects, and industrial visits.
- The industry institute interaction helps to build students confidence in their problem solving abilities.

#### 1.3.2. Explain how administrative system helps in ensuring the achievement of the PEOs (15)

(Describe the committees and their functions, working process and related regulations.)

Several systematic administrative procedures directly or indirectly ensure the achievements of the PEO's. These are:

- The Academic Council (Senate) is the prime body within the Institute which is responsible for all the academic activities in the institute. This body receives proposals from the academic departments (The respective BOS) and discusses the

proposals for their implementations. All other academic activities are also thoroughly discussed in the Senate.

- The curriculum improvement, modifications and additions are governed by Board of Studies (BOS) and executed through senate on a continuous basis based on the feedback from the stakeholders and changing societal needs. This is feasible because our institute is autonomous. The BOS is held once in a semester and all the faculty members are contributing in the curriculum development along with the experts from the IIT/NIT/Industry/Research Institutes. The student class committee meets twice in each semester and their views are incorporated in order to improve the curriculum. The scheme of examination and award of the degree is followed as per the rules set by the senate.
- The training and Placement (T&P) department formally takes feedback from the companies who are coming for campus placement regarding the student quality. these feedbacks are tabulated and used for the upgradation of the Educational Objectives. The companies also objectively indicate the status of the students and their performance levels. The pre placement and post placement meetings also in a way act as feedback mechanism to the students where the students directly interact with the industry representatives.
- The class Committees have been formed to ensure the attainment of the PEO's wherein the results of the student, coverage within each subject and the mode of the coverage is discussed at length. Certain issues raised by the students are addressed in these meetings. These meetings are held thrice, i.e, after every sessional exam.
- There is also a mechanism wherein each student has been allotted one Faculty Advisor (FA) who is responsible to monitor the progress of the student closely. The student is mandatorily required to discuss the courses he selects during registration process after consultation with the FA in every semester. The performance in sessionals and the End Term exam is also monitored by the FA and guidelines are issued. The attendance of the student is also monitored by the FA so as to ensure his involvement in the educational procedure.
- The valuations of all the exams are open for student observation where students personally can see his answerbook and discuss the valuation with the respective course coordinator.
- The parents also may discuss the progress of the student with the respective FA from time to time. If the progress of the student is poor then the FA can specially call the parent for discussion which regularly happens.
- The Feed Back from the industry i.e the user departments and the society at large including the parents is planned henceforth in future to cover certain other factors from the environment to further upgrade and attain the PEO's.

## **1.4. Assessment of the achievement of Programme Educational Objectives (40)**

1.4.1. Indicate tools and processes used in assessment of the achievement of the PEOs (25)

Describe the assessment process that periodically documents and demonstrates the degree to which the Programme Educational Objectives are attained. (10)

Include information on: (15)

- a) A listing and description of the assessment processes used to gather the data upon which the evaluation of each programme educational objective is based. Examples of data collection processes may include, but are not limited to, employer surveys, graduate surveys, focus groups, industrial advisory committee meetings, or other processes that are relevant and appropriate to the programme;
- b) The frequency with which these assessment processes are carried out.

### **(a) The feedback from Training and Placement / Once in a year**

The Feedbacks from the companies conducting the on campus interviews is obtained by the Training and Placement department regularly. For Civil Engineering Department, one Training and Placement secretary is appointed who is responsible to communicate the feedbacks from the companies to the students. Apart from that, a systematic tabulated sheet is prepared by the T & P department which is also placed in front of the Senate and discussions on this are done, preferably each semester.

### **(b) The feedback from student class committees / Thrice in a semester**

The class Committees have been formed to ensure the attainment of the PEO's. Issues related to student learning are discussed at length. Certain issues raised by the students are addressed in these meetings. These meetings are held thrice, i.e, after every sessional exam. The various factors related to students discussed in these meetings are :

1. The results of the student: The grades obtained by the students in each course are discussed apart from the procedure to see the answer books. The major issues regarding the educational procedure in the duration of the course are discussed and the process of learning is moderated.
2. Coverage within each subject and the mode of the coverage is also discussed. It may be seen from the minutes of these class committee meetings that every issue is discussed Viz. audability of the teachers in the class, the overall impact of the class room teaching, facilities in the class room and labs, the support mechanisms in the labs, the time schedule for assignments and seminars etc.
3. The attendance issue of students not regular in their presence in the class is also discussed. Students with less than critical attendance are especially communicated through their FA.

- (c) The Board of Study includes members from the industry and other educational institutes of excellence as mentors. These experts suggest areas of skills and knowledge to be improved upon, by the students in the context of changing situation. These experts also suggest some changes to be brought upon in the course curriculum from time to time.

**This meeting happens twice in a year at least.**

- (d) The continuous academic quality assessment is carried out through a peer (external) review process **once in a year**.

- (e) Feedback forms from students and its analysis for improvement / **every semester**

The Feed Back forms have been specially designed to cover all the aspects related to the PEO's. This Feed Back form contains following areas (Feed Back Form is given as Appendics II):

1. The teachers knowledge and interaction in the class
2. The pace of the teaching
3. The interest generation in the course
4. Facilities for the course (Books, Manuals etc.)
5. Lab Facilities

- (f) New modes of feedbacks have been recently started which includes Graduate Surveys and alumni survey. The outcomes of these surveys are utilised for upgrading and facilitating the PEO's further.

**These are conducted once in a year.**

Students are free to suggest improvement or changes in any of the aspects as deemed correct by the course coordinator.

#### **1.4.2. Provide the evidences for the achievement of the PEOs (15)**

- a) The expected level of attainment for each of the program educational objectives;

The achievements of the PEO's are evident by the performance of the graduates of this program and the achievements may be quantified through surveys of the graduates already working in the industry. Surveys have been conducted this year from the students recently graduated and the students who have graduated 5-10 years back.

The surveys are oriented towards understanding the contribution of the learning through this program which has helped these students in their

promotions and attaining a position of leadership in their respective organizations.

Following are the PEO's and the evidences which could be gathered through these surveys for fulfillment of the PEO's.

1. Actively engage in problem solving using engineering principles to address the evolving needs of the society

The student should be able to plan and design various civil engineering structures and systems.

2. To be able to succeed in positions in civil engineering practice or research, and in other fields they choose to pursue and enroll in advanced studies.

To lead or occupy position of importance in organizations involved in civil engineering profession and research.

3. Make ethical decisions and demonstrate a commitment to service to the profession and society.

To focus on the sustainability aspects of the systems for insuring the social responsibilities.

4. Acquire a position or degree that values adaptability and innovation in their work.

The degree possessed by the student must be recognised at all levels.

5. Pursue lifelong learning, and to be leaders, both in their chosen profession and in other activities.

To be innovative and creative through sustained reference to the academic materials.

**b) Summaries of the results of the evaluation processes and an analysis illustrating the extent to which each of the programme educational objectives is being attained;**

1. Primary indicator of attainment of PEO's is the placement status.
2. Second indicator of attainment is the sustained performance of the graduate in the organization in the areas covered in the PEO's.
3. Third indicator is the progression of the students in the respective organization which is based on attainment of the PEO's.

**c) How the results are documented and maintained.**

- The PEO's may be directly correlated with the career achievements and career progression of the graduates. The alumni association within the institute maintains the data regarding the alumni as well as now the

graduate feedbacks are conducted by the department. Various graduates have reached to excellent positions in the industry and other organizations and are contributing significantly in the nation's development. There are several leaders who are leading the companies and organizations having graduated from this department. There are few entrepreneurs also who are not only contributing technically but also providing employment to other engineers.

- The results of the evaluation process are tabulated and discussed in the departmental meetings.
- The formats for Feedback from students and alumni have been designed.
- Attached as Annexure

### **1.5. Indicate how the PEOs have been redefined in the past (10)**

(Articulate with rationale how the results of the evaluation of PEOs have been used to review/redefine the PEOs)

Earlier, there were no formal processes for PEOs. However these were assessed on the basis of performance of past three pass out batches and feedback given by stakeholders. But now in the recent past, a formal method of conducting graduate surveys and monitoring and redefining PEO's have been taken up by the department.

- The BOS continuously discusses the POE's in its meetings. There are expert members from industry and Institutes of excellence which provide important and crucial inputs for redefining the PEO's based on the changes in the external world and requirements.
- The graduate Surveys also provide data for the modifications of the PEO's.
- The department faculty is engaged in the consultancy jobs provided to the industry. This is an area which continuously upgrades the current upgrades in the technology and its implementation. Based on the industry requirement, the faculty members are continuously upgrading the skills so that consultancy projects may be taken up. This also helps in upgrading the PEO's based on the changes in the industry.
- The new courses have been introduced frequently depending upon the requirements of the industry and this has been seen as one of the important fact in upgradation of the PEO's.
- Faculty members of the department are also involved in the research. They have research projects and the research publications by the faculty members and by the other scientists are also taken into account while redefining the PEO's.

## 2. Programme Outcomes (225)

### 2.1. Definition and Validation of Course Outcomes and Programme Outcomes (30)

2.1.1. List the Course Outcomes (COs) and Programme Outcomes (POs) (2)  
(List the course outcomes of the courses in programme curriculum and programme outcomes of the programme under accreditation)

#### List of Course Outcomes (COs)

Course Code	Course title	Course Outcomes ( COs)
<b>DC (Departmental Core)</b>		
CEL201	Soil Mechanics	<ol style="list-style-type: none"> <li>1. Gain a broad understanding of mechanics of soil</li> <li>2. Get accustomed with the measurement of different soil parameters.</li> <li>3. Shear strength and permeability of soil as suitable construction material.</li> <li>4. Contemporary issues and developments.</li> </ol>
CEL202	Hydraulic Engineering	<ol style="list-style-type: none"> <li>1. Understand the relation between formulations and real site situations..</li> <li>2. Application of equations in the design of fluid system.</li> <li>3. Will develop analytical skills in handling variety of data.</li> <li>4. Latest problematic issues and developments.</li> </ol>
CEL203	Environmental Engineering I	<ol style="list-style-type: none"> <li>1. Understand the water supply scheme and be able to estimate quantities and quality of water for municipal use</li> <li>2. Understand the types of processes used to treat water for municipal purpose</li> <li>3. Understand how processes are configured in treatment systems.</li> <li>4. Understand the fundamental engineering and science principles that are used to design and operate the processes used in treatment systems.</li> <li>5. Learn how to use laboratory procedures and measurements to determine qualitative parameter of water and wastewater.</li> <li>6. Understand basics of solid waste management.</li> </ol>
CEL204	Building Materials & Technology	<ol style="list-style-type: none"> <li>1. Understand the importance and role of each component in building,</li> <li>2. Apply basic fundamentals of design and construction for any building,</li> <li>3. Select construction materials under different site</li> </ol>

		<p>conditions by understanding the basic properties of materials,</p> <p>4. Supervise the construction work of buildings,</p>
CEL205	Building Design and Drawing	<ol style="list-style-type: none"> <li>1. Gain a broad understanding of planning and designing of buildings</li> <li>2. Develop working and submission drawings for any building</li> <li>3. Know the procedures of submission of drawings and getting sanctions for a project</li> <li>4. Plan and design a residential or public building as per the given requirements</li> <li>5. Develop the perspective views for any building.</li> </ol>
AML212	Strength of Materials	<ol style="list-style-type: none"> <li>1. Gain a broad understanding of behavior of materials,</li> <li>2. Identify forces to be resisted by member,</li> <li>3. Analyze stresses in member,</li> <li>4. Determine deformations of simple members,</li> </ol>
CEL206	Engineering Geology	<ol style="list-style-type: none"> <li>1. Generate global vision of Earth processes</li> <li>2. Identify the subsurface material</li> <li>3. Knows reason of phenomena like Earthquakes and zoning</li> <li>4. Know about groundwater availability zones and groundwater management</li> <li>5. Know megascopic and mechanical properties of rocks</li> <li>6. Know field procedures of subsurface exploration</li> <li>7. Generate subsurface profiles and map structures</li> <li>8. Know considerations for site selection for engineering projects</li> </ol>
CEL207	Surveying I	<ol style="list-style-type: none"> <li>1. Gain a broad understanding of Land Survey</li> <li>2. Get accustomed with the angular and linear measurements.</li> <li>3. Trained with recording the field information and necessary plot.</li> <li>4. Contemporary issues and developments.</li> </ol>
CEL301	Foundation Engineering	<ol style="list-style-type: none"> <li>1. Understand the remote sensing process</li> <li>2. Understand digital data in different and their formats</li> <li>3. Know about National and International RS Programs</li> <li>4. Know about various satellites and images</li> <li>5. Know about changing field practices in Survey</li> <li>6. Know how to generate different types of digital data</li> <li>7. Know about Application areas</li> </ol>



CEL302	Transportation Engineering	<ol style="list-style-type: none"> <li>1. Gain a broad understanding of transportation engineering</li> <li>2. Transportation systems and organizations</li> <li>3. Driver, vehicle, pedestrian, road and traffic characteristics.</li> <li>4. Basic understanding of various bridge design parameters</li> <li>5. Ability to characterize pavement materials</li> <li>6. Contemporary issues and developments.</li> </ol>
CEL303	Environmental Engineering II	<ol style="list-style-type: none"> <li>1. Gain a broad understanding of wastewater engineering</li> <li>2. Wastewater management systems and design of various treatment units</li> <li>3. Understand about the disposal of wastewater.</li> <li>4. Contemporary issues and developments.</li> </ol>
AML361	Structural Analysis	<ol style="list-style-type: none"> <li>1. Able to analysis determinant and in-determinant structures</li> <li>2. Able to understand Structural Responses</li> <li>3. Able to analyse Field problems of Structural analysis</li> <li>4. Dessiminate knowledge of structural Analysis to society.</li> <li>5. Communicate effectively the design parameters to the stakeholders.</li> </ol>
CEL304	Concrete Engineering	<ol style="list-style-type: none"> <li>1. Achievement of basic knowledge on Concrete Technology, Concrete production, its type &amp; applications in field of construction.</li> <li>2. Achievement of Conceptual understanding of what is Engineered concrete?</li> <li>3. Achievement of Knowledge of prestressed concrete ,its requirement in construction , application &amp; design</li> <li>4. Acquired basic knowledge of design of elementary RCC elements like one way slab, beams, column &amp; footings.</li> </ol>
CEL305	Design of RCC Structures	<ol style="list-style-type: none"> <li>1. To understand conceptually the difference between Working stress method, Ultimate load theory method &amp; Limit state Design method.</li> <li>2. To design the structural elements like RCC beam, slab, column, and footings by limit state Design method as per I.S.456-2000.</li> <li>3. To design two way slab &amp; one way continuous slabs</li> <li>4. To design columns &amp; footings for eccentric</li> </ol>

		loads. 5. To design RCC Retaining walls & design of water tanks.
AML363	Design of steel structures	<ol style="list-style-type: none"> <li>1. Capable of using all loading and limit state design methods for steel structures.</li> <li>2. Capable of elementary design of tension /compression member.</li> <li>3. Able to provide the design of beams, column base plates, plate girder.</li> <li>4. Capable of understanding the types of structural fasteners and their behavior and connections.</li> <li>5. Competent enough to analysis and design of steel structures and able to provide the good quality control during the steel construction.</li> </ol>
CEL306	Surveying II	<ol style="list-style-type: none"> <li>1. do curve surveying for highways and railways curves</li> <li>2. Understand the basics of Geodetic surveying, Field astronomy, Triangulation, Photographic and hydrographic surveying.</li> <li>3. use Auto level, Total stations and other advanced instruments in surveying</li> <li>4. Plan and doing surveying in a team for real life works.</li> </ol>
CEL307	Project Planning & Management	<ol style="list-style-type: none"> <li>1. Planning of various construction projects such as Building, Roads, etc.</li> <li>2. Manpower requirement planning during project</li> <li>3. Equipment planning</li> <li>4. Material planning</li> <li>5. Quality and Safety measures at Site</li> </ol>
CEL401	Irrigation Engineering	<ol style="list-style-type: none"> <li>1 Relate with socio economic aspects of agriculture.</li> <li>2 Understand &amp; assess requirements of irrigation.</li> <li>3 Have insight of planning &amp; design of storage irrigation systems- Dams.</li> <li>4. Plan &amp; design irrigation water conveyance systems</li> </ol>
CEL402	Estimating and Costing	<ol style="list-style-type: none"> <li>1. Estimate the cost of any building</li> <li>2. Design technical specifications for any project</li> <li>3. Invite tenders and arrange contracts on behalf of Govt.,</li> <li>4. Carry out rate analysis of various items in construction,</li> <li>5. Fix the value of built up properties and land, fixation of rent for a property,</li> </ol>
CED401	Project Phase I	<ol style="list-style-type: none"> <li>1. To understand the application aspect of fundamentals</li> </ol>

		<ol style="list-style-type: none"> <li>2. To identify the scope of problem and</li> <li>3. To conduct Literature review</li> </ol>
CED402	Project Phase II	<ol style="list-style-type: none"> <li>1.To undertake experimentation / design / development of models</li> <li>2. To analyse the data and results</li> <li>3. To compile the thesis</li> </ol>
MAL202	Numerical Analysis	
CEL208	Hydrology	<ol style="list-style-type: none"> <li>1. Realize the importance of water.</li> <li>2. Hydrological cycle and various components.</li> <li>3. Will develop analytical skills in handling variety of data.</li> <li>4. Latest problematic issues and developments.</li> </ol>
CEL209	Construction Materials	
CEL 430	Computer Aided Analysis and Design	<ol style="list-style-type: none"> <li>1. gain a broad understanding of IT in civil engineering.</li> <li>2. identify, formulate, and solve engineering problems</li> <li>3. contemporary issues and development</li> <li>4. use the techniques, skills, and modern engineering tools necessary for engineering practice.</li> </ol>
CEL309	Fluid Mechanics	<ol style="list-style-type: none"> <li>1. Analyse the relative equilibrium of fluids</li> <li>2. Estimate various thickness terms associated with boundary layer</li> <li>3. Use Moody's Diagram to assess head loss for flow through pipes</li> <li>4. Analyse the flow through pipes</li> <li>5. Compute drag and lift forces on immersed bodies</li> <li>6. Analyse the uniform flow and critical flow conditions in open channel flows</li> </ol>
CEL310	Energy Efficient Buildings	<ol style="list-style-type: none"> <li>1. gain a broad understanding of energy efficient building designs.</li> <li>2. identify, formulate, and solve engineering problems</li> <li>3. contemporary issues and development</li> <li>4. use the techniques, skills, and modern engineering tools necessary for engineering practice.</li> </ol>
AML461	Advanced Structural Analysis	<ol style="list-style-type: none"> <li>1. Able to choose method of analysis for indeterminate structure</li> <li>2. Able to understand stiffness method: structure as well as member approach</li> </ol>

		3. Able to analyse nonprismatic beams
CEL311	Pavement Design	<ol style="list-style-type: none"> <li>1. Gain broad understanding of mechanical properties of pavement material like bitumen and cement and various methods of pavement design being practiced in India</li> <li>2. Design a pavement using relevant IS/IRC codes.</li> <li>3. Carry out bitumen mix design</li> </ol>
CEL 368	Advanced Hydraulic	<ol style="list-style-type: none"> <li>1. Estimate equivalent roughness for compound channels</li> <li>2. Analyse and compute the Gradually Varied Flow (GVF) profiles</li> <li>3. Locate the hydraulic jump in prismatic channels</li> <li>4. Compute water hammer pressures in long pipelines</li> <li>5. Estimate maximum upsurge in Surge Tanks</li> </ol>
CEL403	Rural Water Supply & Sanitation	<ol style="list-style-type: none"> <li>1. Gain a knowledge about various rural water supply programmes in India</li> <li>2. Able to understand various water supply scheme, design of rural water supply schemes.</li> <li>3. Able to understand about various rural sanitation schemes in India</li> <li>4. Gain knowledge about the methods of low cost sanitation</li> <li>5. Gain knowledge about the design of septic tanks.</li> </ol>
AML425	Advanced Steel Design	<ol style="list-style-type: none"> <li>1. Capable of using all national as well as International loading and design methods for steel structures.</li> <li>2. Capable of design of elements for steel construction.</li> <li>3. Able to provides the design of industrial sheds with or without cranes, connections</li> <li>4. Capable of providing the design of bridges using composite construction.</li> <li>5. Competent enough to scrutinize the analysis and design of steel structures.</li> </ol>
CEL404	Railway, Airports, Ports & Harbor Engineering	<ol style="list-style-type: none"> <li>1. Gain broad understanding various modes of transportation and their interrelation.</li> <li>2. will be able to design airport pavement using relevant IS/IRC codes.</li> <li>3. Carry out bitumen mix design for pavement at airport</li> </ol>
CEL405	Industrial Waste Water Treatment Recycle & Reuse	<ol style="list-style-type: none"> <li>1. Understand and apply basic concepts of wastewater treatment.</li> <li>2. Design system, component or processes for industrial wastewater treatment.</li> <li>3. Understand how to identify, formulate and do</li> </ol>

		<p>engineering design calculations using hydraulic principles and calculation techniques for industrial wastewater treatment process.</p> <ol style="list-style-type: none"> <li>4. Understand and demonstrate the process of developing treatment alternative flowsheets through case studies and team-oriented technical presentations</li> <li>5. A knowledge of contemporary issues of industrial wastewater treatment.</li> </ol>
CEL406	Advanced Concrete Technology	<ol style="list-style-type: none"> <li>1. Achievement of adequate knowledge in Concrete Technology which is ready for its immediate application in field concrete problems.</li> <li>2. Achievement of adequate knowledge for designing concrete for industrial / severe/aggressive environments with understanding of science &amp; engineering of concrete.</li> <li>3. Acquired knowledge on Deterioration and repair technology of concrete.</li> <li>4. Updated knowledge in design &amp; research.</li> <li>5. Ready to work on construction demanding special requirements.</li> <li>6. Acquired knowledge in various concrete construction methods &amp; equipments in various challenging situations. Emergency preparedness in case repairs &amp; rehabilitation of structures in case of disasters like earthquake, fatigue &amp; dynamic loadings etc.</li> <li>7. Theory substantiated by conducting practicals related field of concrete construction</li> </ol>
CEL 554	Construction Finance	<ol style="list-style-type: none"> <li>1. Preparation of a Budget requirement of the Project</li> <li>2. Monthly Planning of Financing of a project.</li> <li>3. Determine Benefit cost ratio.</li> <li>4. Determine Economic life of the Equipment's.</li> <li>5. Can prepare a Job cost report of running project.</li> <li>6. Can estimate Return on Cost Employed (ROCE) and Economic Value Addition (EVA)</li> </ol>
AML467	Advanced RCC	<ol style="list-style-type: none"> <li>1. Design a building from foundation to roof level</li> <li>2. Read structural drawings of RCC building</li> <li>3. Understand seismic analysis, design and detailing of building</li> <li>4. Design water tanks on ground surface, underground tank and overhead tank</li> <li>5. Design small bridges</li> </ol>
AML424	Structural	<ol style="list-style-type: none"> <li>1. Convert structure into SDOF system</li> </ol>

	Dynamics	<ol style="list-style-type: none"> <li>2. Find response of free and force vibration (harmonic, periodic and transient) of SDOF system</li> <li>3. Find natural frequency and mode shapes of MDOF system</li> <li>4. Carry out modal analysis of MDOF system</li> <li>5. Performe experiments and computer simulation of vibrating system</li> </ol>
CEL408	Ground improvement Techniques	<ol style="list-style-type: none"> <li>1. Suggest and design a suitable ground improvement methods for a given site condition</li> <li>2. supervise field works for various ground improvement methods.</li> </ol>
CEL409	Quality and safety in construction	<ol style="list-style-type: none"> <li>1. gain a broad understanding of quality and safety in construction</li> <li>2. an ability to function on multidisciplinary teams</li> <li>3. contemporary issues and development</li> <li>4. use the techniques, skills, and modern engineering tools necessary for engineering practice.</li> </ol>
CEL410	Traffic Engineering	<ol style="list-style-type: none"> <li>1. Gain a broad understanding of Traffic analysis and planning needs</li> <li>2. Learn to incorporate safety in planning a facility</li> <li>3. Gain knowledge of level of service of a facility. Understand needs of the users.</li> <li>4. Contemporary issues and developments.</li> </ol>
CEL411	Geotechnical Engineering	<ol style="list-style-type: none"> <li>1. Gets an insight of problems faced in handling foundation problems.</li> <li>2. Understand behaviour of soils.</li> <li>3. Shall be able to design/ handle during executions situations posed by problematic soils.</li> <li>4. Shall have a pre exposure to advanced techniques.</li> </ol>
CEL412	Spatial Analyses for Resources Management	<ol style="list-style-type: none"> <li>1. Understand the remote sensing data products</li> <li>2. Generate digital data in different spatial formats</li> <li>3. Understand spatial, 3D, Network and proximity analysis</li> <li>4. Understand the use of Customised products</li> <li>5. Visualize resources and their interaction</li> <li>6. Analyse the spatial data and provide solutions</li> </ol>
CEL413	Pre-stressed Concrete Structures	<ol style="list-style-type: none"> <li>1. Achievement of adequate knowledge in prestressed concrete structures ready for its dissemination &amp; application.</li> <li>2. Achievement of adequate knowledge in industrial requirements of prestressed concrete.</li> <li>3. Emergency preparedness in case repairs &amp;</li> </ol>

		rehabilitation of structures in case of disasters like earthquake, fatigue & dynamic loadings etc. 4. Updating of knowledge in design & research.
CEL414	Water Distribution Systems	1. Types of problems in water distribution systems 2. Methods for analysis of existing network 3. Various types of analysis of the networks 4. Analysis of networks with controlling elements 5. Design of new networks and strengthening of existing system
CEL415	Advanced Structure Design (RCC)	1. To understand the Philosophy of Design of RCC & Steel Structural Elements with advanced concept. 2. To acquire the skill & knowledge about design of special & typical structures in steel & concrete. 3. To design simple structural forms in roof structures in RCC & steel. 4. To study the Concept of design with respect to plastic Design of steel structural elements. 5. To study the basics of Optimum & minimum weight design of structural elements.
CEL416	Remote Sensing & GIS	1. Understand the remote sensing process 2. Understand digital data in different and their formats 3. Know about National and International RS Programs 4. Know about various satellites and images 5. Know about changing field practices in Survey 6. Know how to generate different types of digital data 7. Know about Application areas
CEL417	Hazardous Waste management	1. Gain a broad knowledge about the hazardous waste 2. Understand sources and classification of hazardous waste. 3. Waste minimization techniques 4. Management of hazardous waste Various rules and regulations for the management and handling of hazardous waste
CEL418	Energy Conversion and Environment	1. Understand and apply basic concepts of energy conversion and environmental protection. 2. Understand fundamentals of waste to energy technology 3. Develop skill to conduct environmental appraisal, perform energy audit and assessment of energy potential of energy sources 4. Perform engineering calculations to design energy conversion systems using scientific and engineering principles 5. Understand contemporary environmental and social issues related to energy conversion

CEL419	River Engineering	<ol style="list-style-type: none"> <li>1. Understand the relation between formulations and occurrences in nature.</li> <li>2. Application of equations of Hydraulic Engineering in the understanding river systems.</li> <li>3. Will develop analytical skills in handling variety of data.</li> <li>4. State of art research and their applications.</li> </ol>
CEL420	Earthen Dam	<ol style="list-style-type: none"> <li>1. Gain a broad understanding of Dam Engineering.</li> <li>2. Get accustoms with seepage analysis and stability analysis.</li> <li>3. Knowledge of different instruments for monitoring and dam safety.</li> <li>4. Contemporary issues and developments.</li> </ol>
CEL421	Hydraulic Structures I	<ol style="list-style-type: none"> <li>1. Classify the spillways and know the functioning of each type</li> <li>2. Design ogee spillway</li> <li>3. Design stilling basin</li> <li>4. Identify the required type of energy dissipator</li> <li>5. Design culverts and guide bunds</li> </ol>
CED312	Mini Project	<ol style="list-style-type: none"> <li>1. To understand the application aspect of fundamentals</li> <li>2. To identify the scope of problem</li> <li>3. To conduct Literature review</li> <li>4. To undertake experimentation / design / development of models</li> <li>5. To analyse the data and results</li> <li>6. To compile the report</li> </ol>
CEL422	Disaster Management	<ol style="list-style-type: none"> <li>1. gain a broad understanding of disaster management.</li> <li>2. Broaden the education necessary to understand the impact of disaster in a global, economic, environmental, and societal context</li> <li>3. contemporary issues and development</li> <li>4. use the techniques, skills, and modern engineering tools necessary for engineering practice.</li> </ol>
CEL 441	Geotechnical aspect for design of Machine foundation	<ol style="list-style-type: none"> <li>1. Gain a broad understanding of Vibration of a system.</li> <li>2. Get accustoms with mode of vibration and wave propagation concept.</li> <li>3. Knowledge of different instruments and relevant soil parameters for design of foundation.</li> <li>4. Contemporary issues and developments.</li> </ol>



CEL 442	Geotechnical Investigation of Construction Projects	<ol style="list-style-type: none"> <li>1. Write geotechnical proposal, specification and reports</li> <li>2. Bore logging and trialpit logging</li> <li>3. Supervise field and lab testings of soil and rocks</li> <li>4. Collect and analyze geotechnical data for various construct projects</li> <li>5. Analyse and suggest proper ground improvement technique for problematic ground conditions</li> </ol>
CEP 425	Seminar	<ol style="list-style-type: none"> <li>1. To assimilate the contents within a topic selected for presentation</li> <li>2. To understand the scientific methodology of the data presentation</li> <li>3. To enhance the communication skills</li> <li>4. To present the analysis carried out with Justification and defend the results.</li> <li>5. To learn procedure for literature survey and selection of material and its synthesis</li> </ol>
<b>List of open Electives</b>		
CEL 416/CEL423	Remote Sensing & GIS	<ol style="list-style-type: none"> <li>1. Understand the remote sensing process</li> <li>2. Understand digital data in different and their formats</li> <li>3. Know about National and International RS Programs</li> <li>4. Know about various satellites and images</li> <li>5. Know about changing field practices in Survey</li> <li>6. Know how to generate different types of digital data</li> <li>7. Know about Application areas</li> </ol>
CEL424	Environmental Studies	<ol style="list-style-type: none"> <li>1. Gain a broad understanding of effect of human activities on natural environment,</li> <li>2. Develop the responsibility of conservation of natural resources for sustainable development,</li> <li>3. Understand the mitigation measures for preventing environmental disasters,</li> <li>4. Develop the sense of biodiversity conservation,</li> <li>5. Develop the understanding of eco-friendly designs for engineering applications,</li> <li>6. Contemporary issues and developments.</li> </ol>
CEL422	Disaster Management	<ol style="list-style-type: none"> <li>1. gain a broad understanding of disaster management.</li> <li>2. Broaden the education necessary to understand the impact of disaster in a global, economic, environmental, and societal context</li> <li>3. contemporary issues and development</li> <li>4. use the techniques, skills, and modern</li> </ol>

		engineering tools necessary for engineering practice.
CEL417	Hazardous Waste management	<ol style="list-style-type: none"> <li>1. Gain a broad knowledge about the hazardous waste</li> <li>2. Understand sources and classification of hazardous waste.</li> <li>3. Waste minimization techniques</li> <li>4. Management of hazardous waste Various rules and regulations for the management and handling of hazardous waste</li> </ol>
<b>Humanities Social Sciences, Management (Elective) (HM)</b>		
CEL425	Financial and Business management	<ol style="list-style-type: none"> <li>1. analyse the management system of the organisation</li> <li>2. understand the role of manager and skills required</li> <li>3. use the swot analysis in decision making</li> <li>4. understand the terminology in marketing, HR, finance, Accounting apply knowledge in industry for effective management</li> </ol>

The Course outcomes of B. Tech. Civil Engineering program are given above and also in Program Curriculum section with respective subjects. The program outcomes are as follows. Parameters on which the PO's of the program are based are given as below and aim of PO's is to enable students to:

- a. Work in Civil Engineering sector which is involved with various aspects of planning, design, construction and operation of structures and systems.
- b. Design and analyse the complex problems and provide state of the art solutions.
- c. Contribute to the academic and research in the broad field of civil engineering.
- d. Develop knowledge and skills in the area of broad domain of civil engineering including construction technology, water resources, environmental engineering, geotechnical engineering, geospatial technology and transportation engineering.

#### **Program outcomes adopted for correlation to course outcomes.**

Graduates Attributes (GA's) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. The GA's are indicators of the attributes expected of a graduate from an accredited program. The Graduates of this program must acquire:

- a. An ability to apply knowledge of mathematics, science, and engineering to solve Civil engineering problems
- b. An ability to identify, formulate, design and conduct experiments, as well as to analyze and interpret data
- c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, safety, and sustainability
- d. An ability to understand engineering and management functions and to be able to function on multidisciplinary teams
- e. An ability to identify, formulate, and solve civil engineering problems

- f. An understanding of professional and ethical responsibility to extend the social benefit of the civil engineering project
- g. An ability to communicate effectively to handle complex engineering activities with the engineering community and the society at large, and should possess the skill of technical writing and effective presentation.
- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, and societal context
- i. A recognition of the need for, and an ability to engage in independent life-long learning to incorporate technological innovations
- j. A knowledge of contemporary issues and environment,
- k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

**2.1.2. State how and where the POs are published and disseminated (3)**

(Describe in which media (e.g. websites, curricula books) the POs are published and how these are disseminated among stakeholders)

The PO's of the Civil Engineering Program are widely physically displayed in the labs, departmental rooms etc. These have also been included in:

- Departmental syllabus booklet,
- departmental information brochure,
- website

**2.1.3. Indicate processes employed for defining of the POs (5)**

(Describe the process that periodically documents and demonstrates that the POs are defined in alignment with the graduate attributes prescribed by the NBA.)

- i. The curriculum improvement, modifications and additions are governed by BOS and executed through Senate on a continuous basis, ours being an autonomous institute. The mentor committee consists of experts from IIT/NIT/Industry/Research Institute who meet on a regular basis.
- ii. The BOS is held once in a semester and all the faculty members are contributing in the curriculum development. The student committee meets twice in each semester and their views are incorporated in order to improve the curriculum.
- iii. The scheme of examination and award of the degree is followed as per the rules set by the senate.

**2.1.4. Indicate how the defined POs are aligned to the Graduate Attributes prescribed by the NBA (10)**

(Indicate how the POs defined for the programme are aligned with the Graduate Attributes of NBA as articulated in accreditation manual.)

<b>Program Outcomes</b>	<b>Graduate Attributes</b>
a. An ability to apply knowledge of mathematics, science, and engineering to solve Civil engineering problems	<b>Engineering Knowledge :</b> Apply the knowledge of mathematics, science, and engineering fundamentals and engineering specialisation to solution of complex engineering problems
b. An ability to identify, formulate, design and conduct experiments, as well as to analyze and interpret data	<b>Problem Analysis:</b> Identify, formulate, research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences
c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, safety, and sustainability	<b>Design/ Development of Solutions :</b> Design solutions for complex engineering problem and design system components or process that meet specified needs with appropriate consideration for public health and safety, and the cultural societal and environmental considerations
d. An ability to understand engineering and management functions and to be able to function on multidisciplinary teams	<b>Project Management &amp; finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as member and leader in a team to manage projects and in multi disciplinary environments
e. An ability to identify, formulate, and solve civil engineering problems	<b>Conduct investigations of complex problems:</b> use research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
f. An understanding of professional and ethical responsibility to extend the social benefit of the civil engineering project	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibility and norms of the engineering practise
g. An ability to communicate	<b>Communication:</b> communicate

effectively to handle complex engineering activities with the engineering community and the society at large, and should possess the skill of technical writing and effective presentation.	effectively to on complex engineering activities with the engineering community and the society at large such as being able to comprehend and write effective reports and design documentations, make effective presentation, and give and receive clear instructions.
h. The broad education necessary to understand the impact of engineering solutions in a global, economic, and societal context	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
i. A recognition of the need for, and an ability to engage in independent life-long learning to incorporate technological innovations	<b>Life Long Learning:</b> Recognition the need for, and the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
j. A knowledge of contemporary issues and environment,	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental context and demonstrate the knowledge of and need for sustainable development
k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

2.1.5. Establish the correlation between the POs and the PEOs (10)

(Explain how the defined POs of the program correlate with the PEOs)

PEOs/POs	a	b	c	d	e	f	g	h	i	j	k
1	x		x		x				x		x
2	x	x	x		x			x			x
3	x	x	x		x		x			x	x
4	x	x	x		x		x	x			
5	x		x	x	x		x		x		x

## 2.2. Attainment of Programme Outcomes (40)

### 2.2.1. Illustrate how course outcomes contribute to the POs (10)

Course Code	Course title	PO's										
		a	b	c	d	e	f	g	h	i	j	k
<b>DC (Departmental Core)</b>												
CEL201	Soil Mechanics	x	x			x					x	
CEL202	Hydraulic Engineering	x	x	x	x	x						
CEL203	Environmental Engineering I	x	x	x		x					x	x
CEL204	Building Materials & Technology	x	x	x								x
CEL205	Building Design and Drawing	x	x	x				x				x
AML262	Strength of Materials	x	x			x					x	
CEL206	Engineering Geology	x	x		x	x			x			
CEL207	Surveying I	x	x			x					x	
CEL301	Foundation Engineering	x	x	x		X						
CEL302	Transportation Engineering	x	x	x		x					X	
CEL303	Environmental Engineering II	x	x		x	x						X
AML361	Structural Analysis	x	x	x		x	x					x
AML 363	Design of Steel Structures	x	x	x	x	x						
CEL304	Concrete Engineering	x	x	x	x	x						X
CEL305	Design of RCC Structures	x	x	x	x	x						X
CEL306	Surveying II	x			x						x	X
CEL307	Project Planning & Management	x	x		x	x						X
CEL401	Irrigation Engineering	x		x		x				X		
CEL402	Estimating and Costing	x	x				x					X
CED401	Project Phase	x	x	x	x	x	x	x	x	x	x	x

	I											
CEL402	Project Phase II	x	x	x	x	x	x	x	x	x	x	x
MAL202	Numerical Analysis											
CEL208	Hydrology	x	x	x	x	X						
CEL209	Construction Materials											
CEL308	Computer Aided Analysis and Design	x				x					x	X
CEL309	Fluid Mechanics	x	x			x			X			
CEL310	Energy Efficient Buildings	x				x					x	X
AML461	Advanced Structural Analysis	x				x				x		X
CEL311	Pavement Design	x	x			x	X					
CEL 368	Advanced Hydraulic	x		x		x			X			
CEL403	Rural Water Supply & Sanitation	x	x	x	x	x						X
AML425	Advanced Steel Design	x	x	x	x	X						
CEL404	Railway, Airports, Ports & Harbor Engineering	x	x			x	X					
CEL405	Industrial Waste Water Treatment Recycle & Reuse	x	x	x		x	x	x			X	
CEL406	Advanced Concrete Technology	x	x	x				x				
CEL407	Construction Finance			x		x		x		x		
AML467	Advanced RCC	x	x	x	x	x	x				x	X
AML424	Structural Dynamics	x	x				x					X
CEL408	Ground	x		x		x	x					X

	improvement Techniques											
CEL409	Quality and safety in construction	x			x						x	X
CEL410	Traffic Engineering	x	x			x					X	
CEL411	Geotechnical Engineering	x		x		x						X
CEL412	Spatial Analyses for Resources Management	x	x		x	x				x		X
CEL413	Pre-stressed Concrete Structures	x		x		x						X
CEL414	Water Distribution Systems	x		x		x						X
CEL415	Advanced Structure Design (RCC)	x	x	x	x						x	X
CEL416	Remote Sensing & GIS	x	x		x	x				x		x
CEL417	Hazardous Waste management	x	x	x	x	x			X			
CEL418	Energy Conversion and Environment	x		x	x	x	x	x	x	x	x	X
CEL419	River Engineering	x	x	x	x	X						
CEL420	Earthen Dam	x	x			x					X	
CEL421	Hydraulic Structures I	x		x		x			X			
CED312	Mini Project	x	x	x	x	x	x	x	x	x	x	X
CEL422	Disaster Management	x							x		x	X
CEL 441	Geotechnical aspect for design of Machine foundation	x	x			x						X
CEL 442	Geotechnical Investigation of Construction	x	x	x		x	x				X	



	Projects											
CEP 425	Seminar	x	x	x	x	x	x	x	x	x	x	X
CEL 552	Construction Contract & specification			x		x		x		x		
<b>List of open Electives</b>												
CEL423	Remote Sensing & GIS	x	x		x	x				x		x
CEL424	Environmental Studies			x	x		x		x			X
CEL422	Disaster Management	x							x		x	X
CEL417	Hazardous Waste management	x	x	x	x	x			X			
<b>Humanities Social Sciences, Management (Elective) (HM)</b>												
CEL425	Financial and Business management			x	x		x		x	X		

(Provide the correlation between the course outcomes and the programme outcomes. The strength of the correlation may also be indicated)

### 2.2.2. Explain how modes of delivery of courses help in attainment of the POs (10)

(Describe the different course delivery methods/modes (e.g. lecture interspersed with discussion, asynchronous mode of interaction, group discussion, project etc.) used to deliver the courses and justify the effectiveness of these methods for the attainment of the POs. This may be further justified using the indirect assessment methods such as course-end surveys.)

PO/Modes of delivery	1.Black / White Boards	2. Lab/ Experiment	3. Guest Lecture	4. Visit	5.Presentation	6.Assignme nt
a	x	x			x	x
b		x				
c	x	x	x	x	x	x
d		x			x	
e					x	x
f			x	x		
g			x		x	
h		x	x	x		
i					x	x
j	x	x	x			
k		x			x	x

**2.2.3. Indicate how assessment tools used to assess the impact of delivery of course/course content contribute towards the attainment of course outcomes/programme outcomes (10)**

(Describe different types of course assessment and evaluation methods (both direct and indirect) in practice and their relevance towards the attainment of POs.)

Assessments/POs	a	b	c	d	e	f	g	h	i	j	k
Assignments	x		x		x				x		x
Examination	x	x	x		x			x			x
Research Paper	x	x	x		x		x			x	x
Projects	x	x	x		x		x	x			
Seminar	x		x	x	x		x		x		x

**2.2.4. Indicate the extent to which the laboratory and project course work are contributing towards attainment of the POs (10)**

Assessments/POs	a	b	c	d	e	f	g	h	i	j	k
Laboratory	x	x	x	x				x		x	x
Projects	x	x	x		x		x	x			

Example for few labs and projects

Assessments/POs	a	b	c	d	e	f	g	h	i	j	k
Soil Mechanics Laboratory	x	x	x	x				x		x	x
Concrete Laboratory	x	x	x	x	x			x			x
Transportation Laboratory	x	x	x	x	x			x	x		x
Projects: RS and GIS	x	x	x		x		x	x			x
Projects: Water Supply and distribution Networks	x					x		x	x	x	

(Justify the balance between theory and practical for the attainment of the POs . Justify how the various project works (a sample of 20% best and average projects from total projects) carried as part of the programme curriculum contribute towards the attainment of the POs.)

## 2.3. Evaluation of the attainment of the Programme Outcomes (125)

### 2.3.1. Describe assessment tools and processes used for assessing the attainment of each PO (25)

Describe the assessment process that periodically documents and demonstrates the degree to which the Programme Outcomes are attained.

PO	PO Description	Assessment Tools & Processes for attainment of PO
a	An ability to apply knowledge of mathematics, science, and engineering to solve Civil engineering problems	<ol style="list-style-type: none"> <li>1. Numerical and analysis based problems are asked in assignments.</li> <li>2. Tutorials are conducted on design based problems.</li> <li>3. Observation based exercises are conducted.</li> </ol>
b	An ability to identify, formulate, design and conduct experiments, as well as to analyze and interpret data	<ol style="list-style-type: none"> <li>1. There are several courses in curriculum having laboratory experiments.</li> <li>2. Department has well equipped labs to fulfil this outcomes.</li> <li>3. Continuous evaluation is conducted based on experimental exercises.</li> </ol>
c	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, safety, and sustainability	<ol style="list-style-type: none"> <li>1. Several courses to inculcate the design capability of a student are part of curriculum like Design of RCC structures, Design of steel structures etc.</li> <li>2. Students are encouraged for design based mini projects and it's assessment is carried out by presentation and viva voce.</li> <li>3. Design assignments are given to students.</li> </ol>
d	An ability to understand engineering and management functions and to be able to function on multidisciplinary teams	<ol style="list-style-type: none"> <li>1. Mini Projects and Major Projects are taken in groups.</li> <li>2. Group seminars are conducted.</li> <li>3. Students are encouraged to organise group events in the department by evolving internal or external members.</li> </ol>
e	An ability to identify, formulate, and solve civil engineering problems	<ol style="list-style-type: none"> <li>1. Question Papers includes the aspect of problem identification &amp; problem solving.</li> <li>2. Students are encouraged to identify the</li> </ol>

		<p>research problems independently in projects.</p> <p>3. Assignments are oriented to problem identification &amp; problem solving.</p>
<b>f</b>	An understanding of professional and ethical responsibility to extend the social benefit of the civil engineering project	<p>1. Students are provided ample knowledge on professional ethics during the delivery of each course pertaining to that course.</p> <p>2. Guest lectures are arranged to give knowledge of the professional responsibilities.</p>
<b>g</b>	An ability to communicate effectively to handle complex engineering activities with the engineering community and the society at large, and should possess the skill of technical writing and effective presentation.	<p>1. Seminars by students is integral part of every course for internal assessment marks.</p> <p>2. Viva voce for laboratory exercises provide opportunity to express understanding of student.</p> <p>3. Students are encouraged to ask questions in the class and carry out discussion on queries.</p>
<b>h</b>	The broad education necessary to understand the impact of engineering solutions in a global, economic, and societal context	<p>1. Several courses include the aspect of impacts of the engineering solutions on a global, economic, environmental and societal context.</p> <p>2. Seminar topics delivered by the students are selected by the course coordinator to cover these aspects.</p> <p>3. Certain course are designed and included in the curriculum which are especially oriented towards achievement of this objective viz. Environment impact assessment, spatial analysis for resources management, engineering geology etc.</p>
<b>i</b>	A recognition of the need for, and an ability to engage in independent life-long learning to incorporate technological innovations	<p>1. Changes evident in the industry and society are incorporated in the course syllabi of each subject from time to time by the coordinator which implies the need of continuous learning.</p> <p>2. Students are encouraged to refer to the research journals and technical magazines</p>

		to abreast their current knowledge about the changes and continuous learning therefore.
<b>j</b>	A knowledge of contemporary issues and environment,	<ol style="list-style-type: none"> <li>1. Observation and discussion of the current issues pertaining to aspects within civil engineering are encouraged within each course.</li> <li>2. Student seminars are oriented to cover the current problems related to the program.</li> <li>3. Students projects touch several areas of current issues and problems and try to resolve some of these problems, viz. problems in solid waste management, water supply, transportation, green buildings, disaster management, groundwater availability etc.</li> </ol>
<b>k</b>	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	<ol style="list-style-type: none"> <li>1. Several courses within the curriculum cover the aspect of imbibing technical skills and modern engineering tools necessary for engineering practice, viz. design practices, experimental skills and software knowledge.</li> <li>2. Projects in the 3rd year and Final year of the course is also oriented towards learning the technical skills and engineering practices.</li> </ol>

**Include information on: (50)**

a) A listing and description of the assessment processes used to gather the data upon which the evaluation of each the programme educational objective is based. Examples of data collection processes may include, but are not limited to, specific exam questions, student portfolios, internally developed assessment exams, senior project presentations, nationally-normed exams, oral exams, focus groups, industrial advisory committee;

a. Various assessment processes are adopted and carried out by the department in all the courses. Specific exam questions, student portfolios, internally developed assessment exams, senior project presentations, nationally-normed exams, oral exams, focus groups, industrial advisory committee;

Examination- Two sessional examinations per semester are conducted with end semester examination based on complete coverage of syllabus. The average grade of the students in specified core subject is taken as a key performance indicator.

Assignment and quizzes are conducted as a part of continuous assessment.

Seminar and a discussion of a latest and important topic is conducted on a regular interval.

Projects based on software and hardware are offered and assessed by external examiners.

Students are encouraged to appear for MPSC/IES/GATE/PS examinations for their employment.

b. The frequency with which these assessment processes are carried out.

Assessment is continuous through out the semester. After every written examination students are encouraged to peruse their valued answer books. This gives complete transparency. Students are benefited by discussing their answers and perceptions with the faculty members.

### **2.3.2. Indicate results of evaluation of each PO (50)**

c) The expected level of attainment for each of the program outcomes;

- I. The achievements of the PO's are evident by the performance of the graduates of this program at the employability indicators which can be quantified in terms of desired values against actually received by the graduate as PO.
- II. The expected level of PO achievements may be quantified through the placement records each year and also from the surveys of the graduates recently passed and obtained employment in the industry. Surveys have been conducted this year from the students recently graduated.
- III. The surveys are oriented towards understanding the contribution of the outcome through this program which has helped these students in increasing their employability and attaining a position of leadership in their respective organizations.

Following are the indicators in terms of quantification of PO's and the evidences which could be gathered through these surveys. .

1. The student should be able to plan and design various civil engineering structures and systems.
2. To be able to succeed in positions in civil engineering practice or research, and in other fields they choose to pursue and enroll in advanced studies.
3. To lead or occupy position of importance in organizations involved in civil engineering profession and research.
4. To focus on the sustainability aspects of the systems for insuring the social responsibilities.
5. The degree possessed by the student must be recognised at all levels.

6. To be innovative and creative through sustained reference to the academic materials.

**d) Summaries of the results of the evaluation processes and an analysis illustrating the extent to which each of the programme outcomes are attained; and**

The results of evaluation process for attainment of the PO's are indicated by the placement record of the program for the last three years which is included under different head and also the tabulation of the feedbacks from the recently passed out students indicating the strengths and satisfaction level achieved through this program. The Feedback evaluation for the B.Tech Civil Engineering Batch of 2012-2013 is given as below.

P- Partially M- Moderately C- Completely

NAME	ANALYTICAL SKILL			DESIGN SKILL			MANAGE. SKILL			COMMUN. SKILL			TEAM WORK			ETHICAL AND MORAL VALUES			PERSONALITY		
	P	M	C	P	M	C	P	M	C	P	M	C	P	M	C	P	M	C	P	M	C
MODAK SALMAN NASIR HUSSAIN			√			√			√			√			√			√			√
POTU RAJU		√			√			√			√			√			√			√	
MRIGANK SAINI			√		√			√			√			√			√			√	
PALAK MAHESWARY			√		√			√			√			√			√			√	
VISHAL JESHWANI		√			√			√			√			√			√			√	
ANISH NARULA		√			√			√			√			√			√			√	
KESHAV MAHESHWARI		√			√			√			√			√			√			√	
SHRAVAN KALANTRI			√		√			√			√			√			√			√	
KUMAR SUMIT			√		√			√			√			√			√			√	
SATYAM KUMAR			√		√			√			√			√			√			√	
ABHISHEK GUPTA			√		√			√			√			√			√			√	
BAHER BHANDRE			√		√			√			√			√			√			√	
HARI SINGH	√				√			√			√			√			√			√	
DEPAK YADAV		√			√			√			√			√			√			√	
ANOOP MISHRA	√				√			√			√			√			√			√	
MANISH KUMAR		√			√	√		√			√			√			√			√	
TANUJ MAHAJAN			√		√			√	√		√			√			√			√	
NABHAJET BISWAS			√		√			√			√			√			√			√	
ANKUR MATHUR			√		√			√			√			√			√			√	
SAURABH KURJEKAR		√			√			√			√			√			√			√	

UTKARSH MISHRA		√				√			√			√			√			√	
ADITYA HUNGUND			√		√			√			√			√			√		√
NISHANT DIDAWAT	√			√				√	√			√			√			√	
G. PRAVEEN KUMAR REDDY		√				√		√			√			√		√			√
MANGLESH ANGURANA		√			√			√			√			√			√		√
BHARGAVI PODILI			√			√		√			√			√			√		√
INUMULA SAI PRANAV			√			√		√			√			√			√		√
CHAHANDE SAURABH VIJAYKUMAR			√	√				√		√			√	√				√	
NAKUL SUHANE		√			√		√			√			√			√			√
ANIMESH KUMAR DUTTA			√			√		√			√		√			√			√
JUI MUNDIWALE		√				√		√			√			√				√	
SONIKA PRAKASH KUMARI		√			√			√			√			√			√		√
PRATHMESH JICHKAR		√			√			√		√		√			√				√
PARANJOY KUMAR BISWAS			√			√		√			√			√			√		√
SAMTA SANJAY KUBDE			√		√			√			√			√			√		√
SIDDHARTH PANKAJ SHAH			√		√			√			√			√		√			√
SHASHI KANT		√			√			√			√			√			√		√
RUJUTA BHAT			√		√			√			√		√			√			√
MATADEEN MEENA		√			√			√	√			√			√			√	
HIMANSHU R. GAJBHIYE			√			√		√			√			√		√			√
ROHIT MEENA		√			√		√			√		√			√			√	
DEEPESH LALWANI			√			√	√			√			√			√			√
PRASHANT KUMAR YADAV			√			√		√			√			√			√		√
KETAN KULKARNI		√				√	√			√			√		√			√	
PRANAY MUNDRA			√		√			√			√			√			√		√
SHIVANG JAIN			√	√				√			√			√			√		√
ESHWAR SAI SANTOSH		√			√			√			√			√			√		√
APOORVA JHA		√			√			√			√			√		√			√
UDAY			√	√				√			√			√		√			√
SAUBHAGYA DIXIT		√			√			√			√			√			√		√
DAYACHAND		√		√				√			√			√			√		√



**e) How the results are documented and maintained.**

- The results of the evaluation of the PO's are documented as above and maintained at the departmental level.
- The surveys are conducted by the faculty members in charges and the results are evaluated in the departmental meetings.
- Results are utilized for betterment of the PO's by analysing the inputs by the students and also by the results evaluation of the training and Placement records of the department each year.
- There has been for example persuasion of the students for Core Jobs in the Civil engineering industry and more students have been absorbed by the core civil engineering companies indicating strengthening of the PO's.

**2.4. Use of evaluation results towards improvement of the programme (30)**

2.4.1. Indicate how the results of evaluation used for curricular improvements (5)  
(Articulate with rationale the curricular improvements brought in after the review of the attainment of the POs)

The most important consideration in the attainment of the PO's as stated earlier is the Program Curriculum. The Program outcome can be improved by adopting to a sound academic curriculum which covers all the areas pertaining to the program which help in making the student aptitude in the area of Civil Engineering better. The main principle which has been adopted in framing the curriculum in the Department of Civil engineering right from the inception of the program has been to equip the graduate with sound logical and scientific thinking for technological application in the area of civil engineering.

Several new courses have been introduced in past years so as to improve the PO's which have been based on the following factors.

- The observation of the changes in the industry and the need for incorporating the areas newly emerging.
- The feed back of the students in the regular feed backs and also in the class committee meetings.
- The feed back of the recently passed students for assessing the graduates employability
- The feed back of the graduates passed few years back to understand the contribution of PO's in their performance.

Changes in the curriculum of several courses have been made where new topics have been incorporated which are newer dimensions in technology application in respective areas. Also, several new courses based on the evaluation process and its results have been proposed and introduced in the Civil Engineering curricula to strengthen the PO's.

<b>New Course Introduced</b>	<b>Reason based on evaluation of results</b>	<b>PO's attained</b>
Financial and Business Management	To improve managerial skills	Apply contextual knowledge for societal, cultural and economic issues.
Spatial Analysis for Resources Management	To strengthen the computing skills in spatial domain for new present requirement of the industry	Apply the knowledge of engineering for solving complex engineering problems
Green Building Technology	To introduce new technology	Design system components to meet the specified needs
Energy Conversion and Environment	To introduce new approach for environmental sustainability	Understanding the professional engineering solution in societal and environmental context
Construction Finance	To improve financial skills for project management	Apply contextual knowledge for societal, cultural and economic issues.
Hazardous Waste Management	To introduce new approach for environmental sustainability	Understanding the professional engineering solution in societal and environmental context
Geotechnical aspect for design of Machine foundation	To impart specific knowledge on industrial foundations	Identify and analyze complex engineering problems using principles of engineering sciences
Ground improvement Techniques	To understand treatments provided for better land usage	Identify and analyze complex engineering problems using principles of engineering sciences
Structural Dynamics	To improve analysis and design skills of the students	Identify and analyze complex engineering problems using principles of engineering sciences
Industrial Waste Water Treatment Recycle & Reuse	To introduce new approach for environmental	Understanding the professional engineering solution in

	sustainability	societal and environmental context
Construction contracts and specifications	To introduce legal aspects of contracts for better project management	Apply contextual knowledge for societal, cultural and economic issues.

**2.4.2. Indicate how results of evaluation used for improvement of course delivery and assessment (10)**

**Student Feedback Form**

(Articulate with rationale the curricular delivery and assessment improvements brought in after the review of the attainment of the POs)

The sample of the Feedback form is attached herewith. This feedback is collected at the end of every semester.

**Teacher & Course Evaluation Form**

The Department of Civil Engineering and its faculty are engaged in a constant endeavour to make student learn better. Hence, the student feed back procedure has been designed and very rigrouly exerised at the end of each semester.

The Feed Back Form has been designed in such a way that the evaluation of the teacher, the teaching - learning process and the facilities required for the teaching learning are evaluated. The Form is divided into sections which covers the following areas of evaluation. This Feed Back form contains following areas (Feed Back Form is given as Appendics II):

1. The teachers knowledge and interaction in the class
  2. The pace of the teaching
  3. The interest generation in the course
  4. Facilities for the course (Books, Mannuals etc.)
  5. Lab Facilities
  6. Library Facilities
  7. Teacher student Interaction
- Once the Feed back form is collected by the Faculty member who is inchrge of a particular year, and also who is not teaching the students of that year so that students can freely and fearlessly express their views.
  - The data is compiled for each teacher and the course.
  - This compiled data is then utilized to understand the status opf the teaching learning process for each course and each year of the program.
  - Courses where the process of teaching learning is not satisfactory, the Chairman Board of Studies talks individually to the Faculty for bringing necessary changes in the process to enhance the satisfaction level.
  - The student feed back also brings about necessary information on student's engagement in the theory as well as tutorials and practicals, journal

submissions, assignments and seminars.

- The Feed Back forms have been modified from time to time as per requirements of the teaching learning process and also as per the aspirations of the students in connection to the PO of the department.

### **2.4.3. State the process used for revising/redefining the POs (15)**

(Articulate with rationale how the results of the evaluation of the POs have been used to review/redefine the POs in line with the Graduate Attributes of the NBA.)

As stated earlier, the evaluation process involves analysis of the information which is received from the following processes which is then utilized for the revision of the PO's.

- The observation of the changes in the industry and the need for incorporating the areas newly emerging.
- The feed back of the students in the regular feed backs and also in the class committee meetings.
- The feed back of the recently passed students for assessing the graduates employability
- The feed back of the graduates passed few years back to understand the contribution of PO's in their performance.

Since the PO based system has newly been adopted, the PO's would be revised in future based upon the indicators stated above. The basic principle involved would be to keep pace with the industry so that the appropriateness of the graduates should be maintained. The student must acquire the basic fundamental knowledge as well as he/she should be able to fulfill requirements as per demands of the industry.

Since, the institute strictly follows the guidelines prescribed by the NBA, the PO's conform to the Graduate Attributes as prescribed by the NBA. Presently, the PO's defined by the department adhere to the Graduate Attributes prescribed by NBA. As and when, the GA's would change; the PO's will be redefined and revised.

This outcome based process has been introduced this year for the first time. The results of future survey and assessments will be documented in due courses and utilised for revision of PO's.

### 3. Programme Curriculum (125)

#### 3.1. Curriculum (20)

##### 3.1.1. Describe the Structure of the Curriculum (5)

Course Code	Course title	Total number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical <sup>#</sup> (P)	Total Hours	
<b>DC (Departmental Core)</b>						
CEL201	Soil Mechanics	3	0	2		8
CEL202	Hydraulic Engineering	3	0	2		8
CEL203	Environmental Engineering I	3	0	2		8
CEL204	Building Materials & Technology	3	0	2		8
CEL205	Building Design and Drawing	2	0	2		6
AML212	Strength of Materials	3	0	2		8
CEL206	Engineering Geology	3	0	2		8
CEL207	Surveying I	3	0	2		8
CEL301	Foundation Engineering	3	0	0		6
CEL302	Transportation Engineering	3	0	2		8
CEL303	Environmental Engineering II	3	0	0		6
AML361	Structural Analysis	3	0	2		8
CEL304	Concrete Engineering	3	0	2		8
CEL305	Design of RCC Structures	3	0	0		6
CEL306	Surveying II	3	0	2		8
CEL307	Project Planning & Management	3	0	0		6
CEL401	Irrigation Engineering	3	1	0		8
CEL402	Estimating and Costing	3	0	2		8
CED401	Project Phase I	2	0	0		4
CED402	Project Phase II					8
<b>DE (Departmental Electives)</b>						
MAL202	Numerical Analysis	3	0	0		6

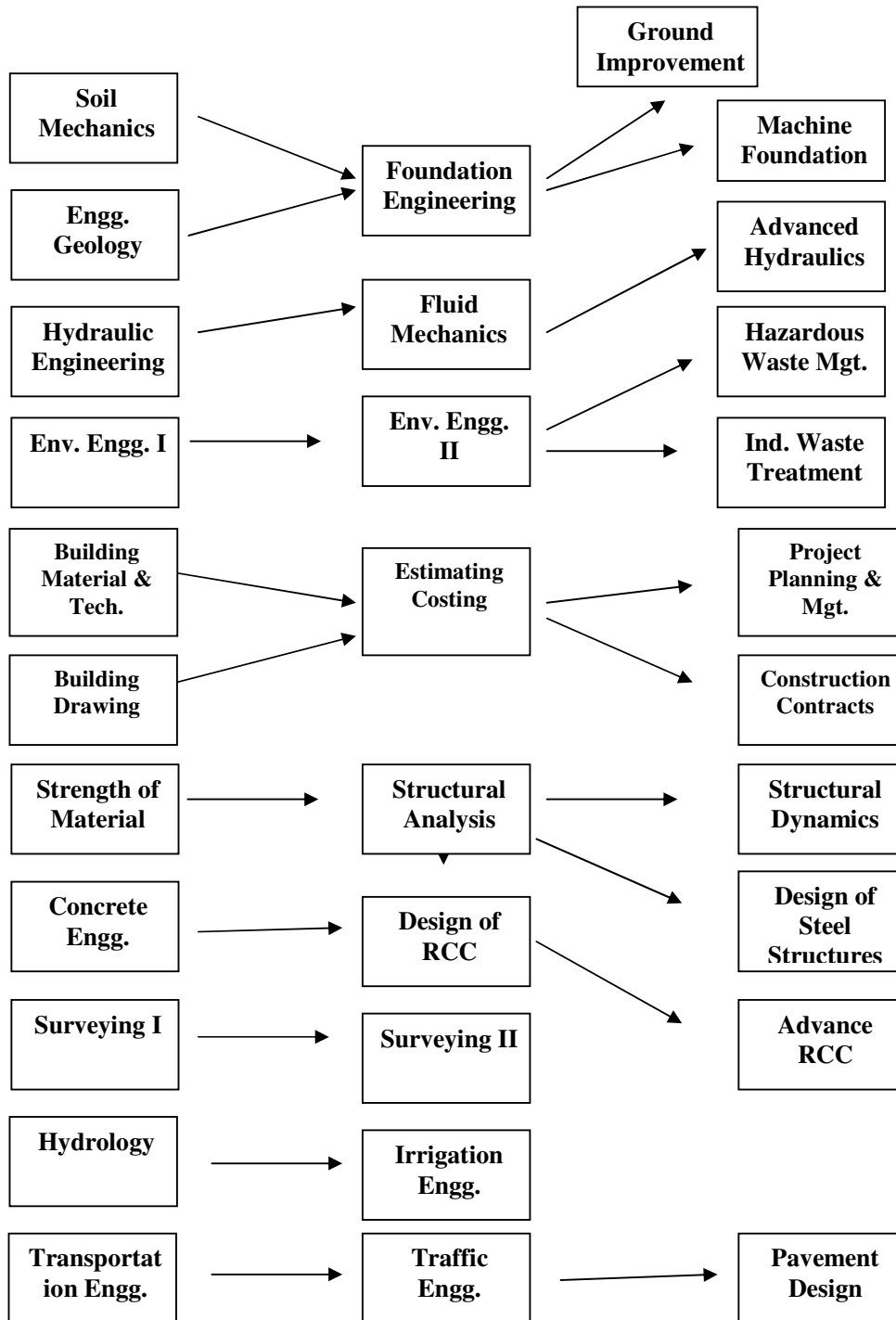
CEL208	Hydrology	3	0	0		6
CEL209	Construction Materials	3	0	0		6
CEL308	Computer Aided Analysis and Design	3	0	2		8
CEL309	Fluid Mechanics	3	0	2		8
CEL310	Energy Efficient Buildings	3	0	0		6
AML461	Advanced Structural Analysis	3	1	0		8
CEL311	Pavement Design	3	1	0		8
CEL 368	Advanced Hydraulic	3	0	0		6
CEL403	Rural Water Supply & Sanitation	3	0	0		6
AML425	Advanced Steel Design	3	1	0		8
CEL404	Railway, Airports, Ports & Harbor Engineering	3	0	0		6
CEL405	Industrial Waste Water Treatment Recycle & Reuse	3	0	0		6
CEL406	Advanced Concrete Technology	3	0	2		8
CEL407	Construction Finance	3	0	0		6
AML467	Advanced RCC	3	1	0		8
AML424	Structural Dynamics	3	0	2		8
CEL408	Ground improvement Techniques	3	0	0		6
CEL409	Quality and safety in construction	3	0	0		6
CEL410	Traffic Engineering	3	0	0		6
CEL411	Geotechnical Engineering	3	0	0		6
CEL412	Spatial Analyses for Resources Management	3	0	2		8
CEL413	Pre-stressed Concrete Structures	3	1	0		8
CEL414	Water Distribution	3	1	0		8

	Systems					
CEL415	Advanced Structure Design (RCC)	3	1	0		8
CEL416	Remote Sensing & GIS	3	0	0		6
CEL417	Hazardous Waste management	3	0	0		6
CEL418	Energy Conversion and Environment	3	0	0		6
CEL419	River Engineering	3	0	0		6
CEL420	Earthen Dam	3	0	0		6
CEL421	Hydraulic Structures I	3	0	0		6
CED312	Mini Project	0	0	0		4
CEL422	Disaster Management	3	0	0		6
CEL 441	Geotechnical aspect for design of Machine foundation	3	0	0		6
CEL 442	Geotechnical Investigation of Construction Projects	3	0	0		6
CEP 425	Seminar	0	0	2		2
<b>List of open Electives</b>						
CEL423	Remote Sensing & GIS	3	0	0		6
CEL424	Environmental Studies	3	0	0		6
CEL422	Disaster Management	3	0	0		6
CEL417	Hazardous Waste management	3	0	0		6
<b>Humanities Social Sciences, Management (Elective) (HM)</b>						
CEL425	Financial and Business management	3	0	0		6

# : Seminars, project work may be considered as practical

**3.1.2. Give the Prerequisite flow chart of courses (5)**

(Draw the schematic of the prerequisites of the courses in the curriculum)





### 3.1.3. Justify how the programme curriculum satisfies the program specific criteria (10)

(Justify how the programme curriculum satisfies the program specific criteria specified by the American professional societies relevant to the programme under accreditation)

The Program Curriculum has been verified in reference to the criteria of the Lead Society: American Society of Civil Engineers. The curriculum of the B. Tech civil Engineering program of Department of Civil Engineering, VNIT Nagpur is oriented towards achieving the Program Outcomes stated earlier. Two specific criteria have been proposed by the American Society of Civil Engineers which are given below. The current program satisfies these criteria.

#### 1. Curriculum

- a. The program prepares graduates to apply knowledge of basic sciences including mathematics through differential equations, calculus-based physics, chemistry; and Engineering sciences viz. Engineering Geology and Environmental studies which is consistent with the program educational objectives. The engineering and basic sciences courses are also oriented towards the PO's of the program and compliment several other technical areas of the program.
- b. Apply knowledge of four technical areas appropriate to civil engineering; focus in the present program is on broad areas which are: Structural Engineering, Environmental Engineering, Geotechnical Engineering, Transportation engineering and hydraulic engineering. The broad categorizations of the courses offered within the program pertaining to these technical areas are as below:

Technical Areas	Courses
Structural Engineering	<ol style="list-style-type: none"><li>1. Strength of Materials</li><li>2. Structural Analysis</li><li>3. Structural Dynamics</li><li>4. Concrete Engineering</li><li>5. Design of RCC Structures</li><li>6. Design of Steel Structures</li><li>7. Prestressed Concrete Structures</li></ol>
Environmental Engineering	<ol style="list-style-type: none"><li>1. Environmental Engineering I</li><li>2. Environmental Engineering II</li><li>3. Hazardous Waste Management</li><li>4. Industrial Waste water Treatment</li><li>5. Energy Conversion and environment</li></ol>
Geotechnical Engineering	<ol style="list-style-type: none"><li>1. Soil Mechanics</li><li>2. Foundation Engineering</li><li>3. Geotechnical Investigations</li><li>4. Geotechnical aspects for Machine Foundation</li></ol>
Transportation engineering	<ol style="list-style-type: none"><li>1. Transportation Engineering</li><li>2. Pavement Design</li><li>3. Traffic Engineering</li><li>4. Railway, airport and Harbour</li></ol>

	engineering
Hydraulic engineering	<ol style="list-style-type: none"> <li>1. Hydraulic Engineering</li> <li>2. Hydrology</li> <li>3. Fluid Mechanics</li> <li>4. Water Distribution System</li> <li>5. Hydraulic Structures</li> <li>6. Irrigation Engineering</li> </ol>
Building Technology	<ol style="list-style-type: none"> <li>1. Building Materials and TEchnology</li> <li>2. Building Design and Drawing</li> <li>3. Estimating and Costing</li> <li>4. Energy Efficient Buildings</li> </ol>

- c. Several Civil Engineering based experiments are conducted in various courses designed in various technical areas and engineering sciences. These experiments are oriented and analyze and interpret the resulting data. There are 16 Laboratories in the department which cater to the need of various courses and experiments therein.
- d. Design a system, component, or process in more than one civil engineering context; there are several courses within the curriculum of civil engineering program which are design based. These are:
- i. Design of RCC Structures
  - ii. Design of Steel Structures
  - iii. Environmental Engineering II
  - iv. Industrial Waste water Treatment
  - v. Foundation Engineering
  - vi. Pavement Design
  - vii. Traffic Engineering
  - viii. Water Distribution System
  - ix. Hydraulic Structures
  - x. Building Design and Drawing
  - xi. Prestressed Concrete Structures
- e. There are courses in the Curriculum which are oriented towards imparting knowledge to the students in the management. These explain basic concepts in management, business, public policy, and leadership; and explain the importance of professional licensure. Apart from this, the students are free to elect certain courses from courses of Humanities Department. The courses within this stream area as below:
- i. Project Planning and Management
  - ii. Financial and Business Management
  - iii. Disaster Management
  - iv. Construction Finance
  - v. Quality and safety in Construction

## 2. Faculty

The program must demonstrate that faculty teaching courses that are primarily design in content are qualified to teach the subject matter by virtue of professional licensure, or by education and design experience. The program must demonstrate that it is not critically dependent on one individual.

- The Program has well qualified faculty members which have the requisite education and training in the respective areas. Practically, faculty with specialization in all the courses explained above is available in the Department.
- Most of the faculty Members have highest Qualification in the respective discipline (Ph.D.) and remaining 10% are pursuing the highest degree.
- Most of the faculty members are involved in the research in the respective technical and allied areas the knowledge generated from this compliments the UG program.
- Most of the Faculty members are also involved in the consultancy services which provide expertise in the design practices.

### 3.2. State the components of the curriculum and their relevance to the POs and the PEOs (15)

Programme curriculum grouping based on different components

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total number of credits	POs	PEOs
Mathematics	5 %	8 hr /week	16	a,b	1
Sciences	10 %	16 hr /week	32	a,b, k , h	1, 2
Computing	9.37 %	15 hr /week	30	a,b,c,e,i, k	1, 2, 4
Humanities	6.87 %	9 hr /week	18	d, f,g,h	3, 4
Professional core	68.76 %	109 hr /week	224	a,b,c,d,e,f, g,h,i,j,k	1,2,3,4,5

### 3.3. State core engineering subjects and their relevance to Programme Outcomes including design experience (10)

(Describe how the core engineering subjects in the curriculum are giving the learning experience with the complex engineering problems) (50)

Subjects	Relevance to Program Outcomes	PO's
Soil Mechanics	<ol style="list-style-type: none"> <li>1. Introduction of formation of soil.</li> <li>2. Different soil Properties and co-relation.</li> <li>3. Behavior of soil under external load.</li> <li>4. Determination and physical understanding of soil parameters.</li> </ol>	<b>a,b,e</b>
Hydraulic Engineering	<ol style="list-style-type: none"> <li>1. Introduce to Fluid state of matter.</li> <li>2. Making students understand the importance of Fluid and its flow.</li> <li>3. To make student explore the various equations and the concepts related fluid motion and equilibrium.</li> <li>4. To make students understand the correlation between theory and practical by making them do practical's which are physical simulations of the theory such as Bernoulli's equation, venturimeter, orifices etc..</li> </ol>	<b>a,b,c,d,e</b>
Environmental Engineering I	<ol style="list-style-type: none"> <li>1. To learn the fundamentals of Water Engineering</li> <li>2. To understand various components of water supply scheme</li> <li>3. To build skills to quantitative and qualitative assessment of water requirement</li> <li>4. To understand how to solve water treatment unit design problems using hydraulic principles and methods</li> <li>5. To understand operation of water treatment units.</li> <li>6. To provide broad knowledge of solid waste management systems.</li> </ol>	<b>a,b,c,e,j,k</b>
Building Materials & Technology	<ol style="list-style-type: none"> <li>1. Introduce to building components.</li> <li>2. Introduce to various materials of construction, understand their properties and their testing procedures.</li> <li>3. Teach principles and methods of construction for each component.</li> <li>4. Teach fundamentals of design for each component.</li> </ol>	<b>a,b,c,k</b>
Building Design and Drawing	<ol style="list-style-type: none"> <li>1. Introduce to building drawing, scales, lines, abbreviations used in drawing,</li> <li>2. Teach development of working and submission drawings from a given plan,</li> <li>3. Teach fundamentals of planning of buildings as per local building bye-laws and planning principles,</li> </ol>	<b>a,b,c,g,k</b>

	4. Introduce to perspective drawings and teach development of two-point perspectives for buildings	
Strength of Materials	<ol style="list-style-type: none"> <li>1. Introduce to mechanical properties of materials,</li> <li>2. Determination of internal forces in member,</li> <li>3. Determination of stresses in cross section of member.</li> <li>4. Theories of failure of brittle and ductile materials.</li> </ol>	<b>a,b,e,j</b>
Engineering Geology	<ol style="list-style-type: none"> <li>1. To Understand the Earth System</li> <li>2. Teach fundamental geomorphic and dynamic processes on the Earth</li> <li>3. To know about the material present i.e. minerals and rocks</li> <li>4. understand Structural deformations and impacts</li> <li>5. Earthquakes and causes, effects, zones</li> <li>6. Know subsurface exploration methods</li> <li>7. Know groundwater availability and domains; recharge</li> <li>8. Teach consideration for site selection for projects.</li> </ol>	<b>a,b,d,e,h</b>
Surveying I	<ol style="list-style-type: none"> <li>1. Principal and rule of Surveying.</li> <li>2. Different Surveying method and related Instrument.</li> <li>3. Use of field book for different Survey.</li> <li>4. Use of with different survey equipments.</li> </ol>	<b>a,b,e,j</b>
Foundation Engineering	<ol style="list-style-type: none"> <li>1. Decision of choosing appropriate shear parameters for stability of slopes, assessment of earth pressures, foundation design &amp; analysis.</li> <li>2. Methods of stability analysis of slopes.</li> <li>3. Various earth pressure theories</li> <li>4. Design &amp; analysis of shallow foundations</li> <li>5. Deciding dimensions of piles &amp; their load carrying capacity</li> <li>6. Learn methods &amp; process of Geotechnical Exploration</li> <li>7. Introduction to Ground Improvement techniques</li> </ol>	<b>a,b,c,e</b>
Transportation Engineering	<ol style="list-style-type: none"> <li>1. Introduce to transportation and traffic engineering.</li> <li>2. Introduction to transportation planning.</li> <li>3. Teach geometric design of highways.</li> <li>4. Teach design of flexible and rigid pavements</li> <li>5. To teach various laboratory testing for characterization of pavement materials</li> <li>6. Introduction to bridge engineering</li> </ol>	<b>a,b,c,e,j</b>

Environmental Engineering II	<ol style="list-style-type: none"> <li>1. Introduce wastewater engineering.</li> <li>2. Teach design of sewer and various wastewater treatment units.</li> <li>3. Introduce air pollution.</li> <li>4. Teach control of air pollution</li> </ol>	<b>a,b,d,e,k</b>
Structural Analysis	<ol style="list-style-type: none"> <li>1. Introduce static and kinematic indeterminacy</li> <li>2. Teach equilibrium based methods of analysis for determinant and indeterminate structures</li> <li>3. Concept of Strain Energy</li> <li>4. To develop the ability to get design parameters such as maximum Bending Moment and maximum Shear Forces etc for determinant and indeterminate structures</li> </ol>	<b>a,b,c,e,f,k</b>
Design of steel structures	<ol style="list-style-type: none"> <li>1. To introduce the limit state method for design of steel structures with loading standards as per codal provision.</li> <li>2. Introduction of structural forms/section with their properties.</li> <li>3. To qualify the students for elementary design of tension/compression members, truss.</li> <li>4. To disseminate the knowledge for design of beams, column with base plates and plate girder.</li> <li>5. To qualify the students to understand the behavior of bolted and welded connection.</li> <li>6. Introduction of connections design for various structural members.</li> </ol>	<b>a,b,c,d,e</b>
Concrete Engineering	<ol style="list-style-type: none"> <li>1. To Emphasis upon importance of concrete as versatile construction material &amp; its suitability &amp; adaptability in concrete construction</li> <li>2. To study knowledge of Concrete making materials &amp; ingredients &amp;. Various parameters affecting properties of concrete including concrete mix proportioning.</li> <li>3. To provide need based Knowledge of methods to obtain various types of concretes.</li> <li>4. Conceptual understanding of Reinforced cement concrete &amp; Properties and design of structural elements like slab, beam column and footings as per Indian standard codes..</li> <li>5. To study the concept of prestressed concrete its properties &amp; to impart</li> </ol>	<b>a,b,c,d,e,k</b>

	<p>knowledge about its mechanized design &amp; methods in light of modern construction.</p> <p>6. To analyze &amp; design various prestressed concrete structural elements per Indian standard specification.</p>	
Design of RCC Structures	<ol style="list-style-type: none"> <li>1. To understand the philosophy of design of RCC structural elements by working stress method, ultimate load theory &amp; limit state design method.</li> <li>2. To study the Limit state Design Concept, risk of failure &amp; various limit states of collapse, including Load factors &amp; partial safety factors.</li> <li>3. To design one way single span slabs and continuous slabs, canopies and two way slabs.</li> <li>4. To provide knowledge of short term, long term deflections of slab, beams.</li> <li>5. To analyze and Design of Singly and Doubly reinforced Beams, “T” and “L” beams.</li> <li>6. To study Limit State of collapse in shear, Bond and Torsion, &amp; design for Interaction between Bending moment, Torsion moment and Shear.</li> <li>7. To study &amp; design Limit state of collapse under compression: Axially loaded short and long column, with axial load, uniaxial and biaxial moment, Interaction diagram / Charts.</li> <li>8. To study &amp; design isolated footing for axially loaded columns, uniaxial bending, and combined footing: Rectangular footing, Strap beam, Trapezoidal, raft etc. To study &amp; design Cantilever &amp; Counterfort Retaining Walls. Dog legged and Open Well Staircase, Circular and Rectangular water tank with roof slab / dome resting on ground</li> </ol>	<b>a,b,c,d,e,k</b>
Surveying II	<ol style="list-style-type: none"> <li>1. To teach about the curve surveying for highways</li> <li>2. Introduction to Geodetic surveying, Field astronomy, Triangulation, Photographic and hydrographic surveying.</li> <li>3. To make the students able to do base line measurement and handle Auto Level &amp; Total station in the field for various</li> </ol>	<b>a,d,j,k</b>

	<p>surveying works.</p> <p>4. To teach how to compute for geodetic position, how to do triangulation adjustment and apply corrections in geodetic quadrilateral</p>	
Project Planning & Management	<p>1. Importance of Project Management as a Civil Engineer.</p> <p>2. Current Construction scenario</p> <p>3. Understanding Project Planning by Different methods</p> <p>4. Understanding quality and safety at construction site</p> <p>5. Understanding types of Construction equipment and its rate analysis</p> <p>6. Understanding material management at construction site</p>	<b>a,b,d,e,k</b>
Irrigation Engineering	<p>1. To get a feel of problems involved with Irrigation Engg.- socio Economic</p> <p>2. To get acquainted with various types &amp; requirements of irrigation, soil moisture relationship Crop patterns.</p> <p>3. Design &amp; construction of various types of dams.</p> <p>4. Water conveyance systems – canals &amp; allied structures.</p>	<b>a,c,e,i</b>
Estimating and Costing	<p>1. Introduce to estimation methods and teach to working out cost of projects,</p> <p>2. Introduce to specifications, their types and standard way of writing,</p> <p>3. Introduce to Contracts, their role in civil engineering construction, and procedures of arranging contracts,</p> <p>4. Teach rate analysis for various items in construction,</p> <p>5. Introduce to valuation, methods of building and land valuation and teach valuation of Properties,</p> <p>6. Introduce to working procedures of PWD and accounting.</p>	<b>a,b,f,k</b>
Hydrology	<p>1. Introduce to Hydrology.</p> <p>2. Making students understand the importance of Water Resources.</p> <p>3. To expose the students to the various components of the water cycle and their importance.</p> <p>4. Teach data analysis using various techniques and implementation of the results.</p>	<b>a,b,c,d,e</b>
Structural Dynamics	<p>1. Introduce fundamentals of vibrations of SDOF system</p> <p>2. Introduce damped and undamped system</p> <p>3. Introduce free and forced vibration</p>	<b>a,b,f,k</b>



	<ol style="list-style-type: none"> <li>4. Introduced free and forced vibration of MDOF system</li> <li>5. Introduced free and forced vibration of continuous system</li> </ol>	
Pre stressed concrete structures	<ol style="list-style-type: none"> <li>1. To bring the civil engineers to such a level so to as enable them, to take the appropriate decision in respect of choice of Prestressed section over R.C.C.</li> <li>2. To make the learners to be aware of such a highly mechanized technology in civil engineering construction.</li> <li>3. To imbibe the culture of entrepreneurship in precast prestressed industry in mass housing .railway sleepers, electric transmission poles etc.</li> <li>4. To understand the basic design considerations in prestressed concrete structures in relation to its applications.</li> <li>5. To employ &amp; develop new techniques in rehabilitation of distressed structures like buildings, Bridges &amp; infrastructures.</li> <li>6. To make prepared for undertaking research problems in prestressed concrete.</li> </ol>	<b>a,c,e,k</b>
Traffic Engineering	<ol style="list-style-type: none"> <li>1. Gain a broad understanding of Traffic analysis and planning needs</li> <li>2. Learn to incorporate safety in planning a facility</li> <li>3. Gain knowledge of level of service of a facility. Understand needs of the users.</li> <li>4. Contemporary issues and developments.</li> </ol>	<b>a,b,e,j</b>
Fluid Mechanics	<ol style="list-style-type: none"> <li>1. Analyse relative equilibrium of fluids</li> <li>2. Teach Hydro-kinematics</li> <li>3. Introduce Boundary Layer Theory</li> <li>4. Analyse flow through pipes and channels</li> <li>5. Teach Drag and Lift forces Introduce Model Analysis in hydraulics</li> </ol>	<b>a,b,e,h</b>
Project Phase I	<ol style="list-style-type: none"> <li>1. To understand the application aspect of fundamentals</li> <li>2. To identify the scope of problem and</li> <li>3. To conduct Literature review</li> </ol>	
Project Phase II	<ol style="list-style-type: none"> <li>1.To undertake experimentation / design / development of models</li> <li>2. To analyse the data and results</li> <li>3. To learn scientific writing and compilation of the results</li> <li>4. To learn to defend the technical outcomes of the study conducted.</li> </ol>	

### 3.4. Industry interaction/internship (10)

(Give the details of industry involvement in the programme such as industry-attached laboratories and partial delivery of courses and internship opportunities for students)

1. The Industry inputs in the program are right from the course curriculum where experts are included in the Board of Studies for their inputs in the process of finalization of curricula
2. The Expert lectures from the industrial experts are frequently arranged in the department with the help of student societies and also within the course delivery.
3. Expert from industry also participate in the projects conducted by the students. The industry experts also are invited as Examiners in the project Exams.
4. The experts from industry participate in the training sessions pertaining to certain lab exercises in certain labs.
5. Students are encouraged to undertake internship / summer training at various industries during vacation period. The details of past three years training undertaken by the students which is arranged through Training and Placement Department of the Institute is given below:

Sr. No	Name of Company	Summer 2013	Summer 2012	Summer 2011
1.	Western Coal Fields Ltd.	4 Students		
2.	Manikgarh Cement	2 Students	2 students	2 Students
3.	UP State Bridge Corporation Ltd.		10 Students	
4.	SECL Bilaspur			5 Students
5.	AFCONS Infrastructures Ltd.			8 Students
6.	Town Planning Department Pune			8 Students

6. Apart from this several students arrange their training directly in several industries for which the information is not tabulated.
7. A student has to submit a satisfactory training completion certificate.

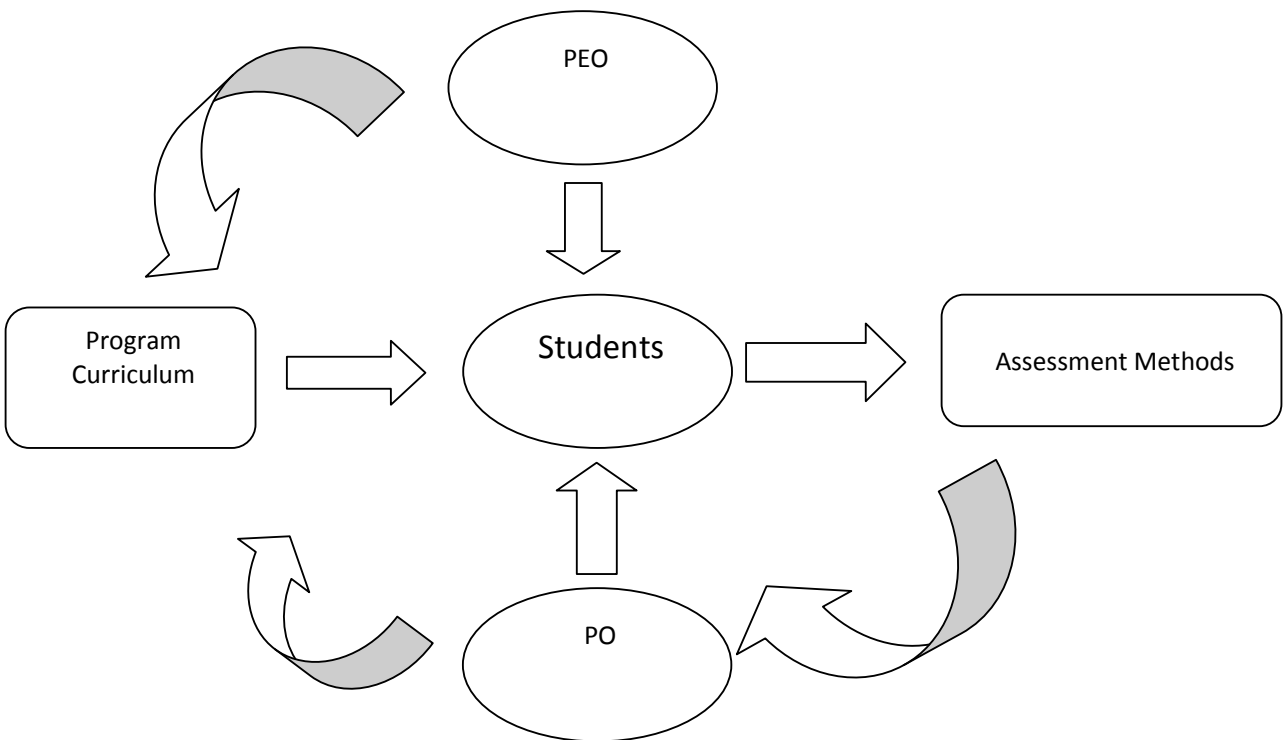
### 3.5. Curriculum Development (15)

#### 3.5.1. State the process for designing the programme curriculum (5)

(Describe the process that periodically documents and demonstrates how the programme curriculum is evolved considering the PEOs and the POs)

There is a definite process for designing the curriculum in the department.

- The Board of studies (BOS) in Civil Engineering is primarily the body which is empowered to design the curriculum.
- All the faculty members are members of the BOS and the BOS also has the external expert members from industry and institutes of excellence.
- The PEO's are the central criteria around which the PO's are decided and the curriculum is then designed having inputs from certain other external and internal factors.
- It is the prerogative of the course coordinator to basically design the course curriculum and include the aspirations of all the stakeholders to make the course curricula as best as possible to have the best PO's.
- The course curriculum designed by the course coordinator is then placed in front of BOS which is discussed thoroughly there and changes and modifications are suggested by other BOS members.
- The proposal is then sent to APEC which is intermediate academic body which rectifies the formats of the course curriculum and forwards it to the senate.
- Finally, the senate approves the contents of the course after deliberations.



### **3.5.2. Illustrate the measures and processes used to improve courses and curriculum (10)**

(Articulate the process involved in identifying the requirements for improvements in courses and curriculum and provides the evidence of continuous improvement of courses and curriculum)

The measures and the processes used to improve courses and the curriculum, which is a continuous process taken up regularly, includes following steps as procedure.

- The course curriculum designed by the course coordinator is continuously upgraded by a process in which there is participation of all the stake holders.
- The external factors consist of the feed backs from recently passed students conforming the PO's and from older students. The interaction of faculty with the external environment is very key factor for including the latest trends of technology in each course material.
- Internal factors are the feed backs from the students which come from the formal feed back mechanism and also from the informal interaction in the class committee's.
- Some inputs are also provided by the stakeholders like companies coming for the campus recruitment and visiting industry experts.
- The faculty members who are involved in the external consultancy are always in touch with the latest trends in the technology and this knowledge gathered is utilized to further improve the course curriculum.
- The faculty is also involved in research wherein the faculty is always upgrading the knowledge which percolates to formal teaching in the program.
- The examination conducted at national level viz. IES and GATE syllabus also provides inputs for the improvement of the course curricula.
- Not only the curriculums of the courses are revised periodically but new courses also have been introduced in the program from time to time.
- As and when the course coordinator wants to upgrade the syllabus of the course, he is free to incorporate the changes which must then be ratified by the BOS and the senate.
- All the details of addition of new courses and upgradation of curriculum are recorded in the minutes of the BOS and SENate meetings.

### **3.6. Course Syllabi (5)**

(Include, in appendix, a syllabus for each course used. Syllabi format should be consistent and shouldn't exceed two pages.)

The syllabi format may include:

- Department, course number, and title of course
- Designation as a required or elective course
- Pre-requisites
- Contact hours and type of course (lecture, tutorial, seminar, project etc.,)
- Course Assessment methods(both continuous and semester-end assessment)
- Course outcomes
- Topics covered
- Text books, and/or reference material

**Attached as Appendix I**

#### 4. Students' Performance (75)

##### Admission intake in the programme

Item	CAY	CAYm1	CAYm2	CAYm3
Sanctioned intake strength in the program (N)	92	92	92	92
Total number of admitted students in first year minus number of students migrated to other programs at the end of 1 <sup>st</sup> year (N1)	89	92	90	91
Number of admitted students in 2 <sup>nd</sup> year in the same batch via lateral entry (N2)	Nil	Nil	Nil	Nil
Total number of admitted students in the program (N1+N2)	89	92	90	91

##### 4.1 Success Rate (20)

Year of entry (in reverse)	Number of Students admitted in 1 <sup>st</sup> year + admitted via lateral entry in 2 <sup>nd</sup> year (N1+N2)	Number of students who have successfully completed*							
		1 <sup>st</sup> year		2 <sup>nd</sup> year		3 <sup>rd</sup> year		4 <sup>th</sup> year	
		W	S	W	S	W	S	W	S
CAY	89								
CAYm1	92	69	81						
CAYm2	90	71	68	77	80				
CAYm3	91	69	68	69	77	79	74		
CAYm4(LYG)	89	60	64	70	76	76	69	79	74
CAYm5(LYGm1)	66	47	51	50	56	56	49	63	62
CAYm6(LYGm2)	60	44	44	51	49	53	54	55	54

\*: Successfully completed implies zero backlogs

Success rate =  $20 \times$  mean of success index (SI) for past three batches

SI= (Number of students who graduated from the programme in the stipulated period of course duration)/(Number of students admitted in the first year of that batch and admitted in 2<sup>nd</sup> year via lateral entry)

Item	LYG (CAYm4)	LYGm1 (CAYm5)	LYGm2 (CAYm6)
Number of students admitted in the corresponding First year + laterally admitted via lateral entry in 2 <sup>nd</sup> year	89	66	60
Number of students who have graduated in the stipulated period	86	65	59
Success Index (SI)	0.96	0.98	0.98

Average SI = .....0.97.....

Success Rate = 20\* Average SI = .....19.4.....

#### 4.2. Academic Performance (20)

API	=	Academic Performance Index
	=	Mean of Cumulative Grade Point Average of all successful Students on a 10 point CGPA system
Or	=	Mean of the percentage of marks of all successful students / 10

Assessment = 2 x API

Av. Assessment for three years

Approximating The API by the following mid-point Analysis	LYG	LYGm1	LYGm2
9<Number of Students with CGPA<10	6	5	4
8<Number of Students with CGPA<9	14	20	14
7<Number of Students with CGPA<8	29	16	24
6<Number of Students with CGPA<7	20	14	9
5<Number of Students with CGPA<6	14	10	8
Total	86	65	59
Mean of Cumulative Grade Point Average of all successful Students on a 10 point CGPA system	7.22	7.36	7.38
Assessment = 2 x API	14.44	14.72	14.76
Avg. Assessment for three years	14.64		

#### 4.2.1. Placement and Higher Studies (20)

$$\text{Assessment Points} = 20 \times (x + 1.25y)/N$$

where, x = Number of students placed

y = Number of students admitted for higher studies with valid qualifying scores/ranks, and

N = Total number of students who were admitted in the batch including lateral entry subject to maximum assessment points = 20.

Item	LYG	LYGm1	LYGm2
Number of admitted students corresponding to LYG including lateral entry (N)	89	66	60
Number of students who obtained jobs as per the record of placement office (x1)	43	46	48
Number of students who found employment otherwise at the end of the final year (x2)	0	0	0
$x = x1 + x2$	43	46	48
Number of Students who opted for higher studies with valid qualifying scores/ranks (y)	27	11	7
Assessment Point	17.24	18.11	18.92

Average assessment points = \_\_\_\_\_18.09\_\_\_\_\_

#### 4.3. Professional Activities (15)

##### 4.3.1. Professional societies / chapters and organising engineering events (3)

(Instruction: The institution may provide data for past three years).

1. Every year, Inter Institute Design Contest is organised by the B.Tech Civil Engineering students within the Inter Institute Technical Event of VNIT named 'AXIS'. In this design contest, a problem of structural design is given and students have to design a structure with given parameters. The structures are then tested for the structural criteria and winners are announced. Around 100 entries are received every year.
2. Management event within ' Consortium- The management event of VNIT' is organised each year within which departmental students organize events related to technical management aspects.
3. There is a Civil Engineering Society in the Civil Engineering Department which is completely constituted and managed by the B Tech students of Civil Engineering. The Society organizes several events during the year including ' Engineers Day', Guest Lectures, Freshers, Farewell, Technical Talks and Group Discussions each year.
4. There are student chapters of Indian Water Works Association ( IWWA) and Indian Concrete Institute (ICI) in the department. The students organize

programs in coordination with these bodies as and when the schedule permits. One day workshops have been organised in collaboration with these bodies.

**4.3.2. Organisation of paper contests, design contests, etc. and achievements (3)**  
(Instruction: The institution may provide data for past three years).

1. An event was organized “Colloquium on Green Building Concepts, 18<sup>th</sup> March, 2012 for undergraduate and post graduate students of Civil Engineering & Architecture.
2. Quiz for Civil Engineering Undergraduates was organized jointly by IIT, Bombay & VNIT, Nagpur.

**4.3.3. Publication of technical magazines, newsletters, etc. (3)**

(Instruction: The institution may list the publications mentioned earlier along with the names of the editors, publishers, etc.).

1. A news Magazine is published yearly by the B.Tech Civil Engineering students which includes some technical articles, information on the departmental activities and other important information.

**4.3.4. Entrepreneurship initiatives, product designs, and innovations (3)**

(Instruction: The institution may specify the efforts and achievements.)

An intercollegiate management event is organised in the institute which is called 'CONSORTIUM'. It is an annual event in which several departments organize events pertaining to their areas. The prof In Charge of this event for last three years is from Department of Civil Engineering.

Students from the department of civil engineering are one of the lead organisers of this event.

SEveral students from department of civil engineering are successful entrepreneurs who are establishing their enterprise at a good pace. Pasouts of last three years, to name a few are:

- Mr. Krishnakant Lande has established his construction company.
- Mr. Ankit Bansal has also established his industrial unit.
- Mr. Ashwin Balivada has established his Food industry at Goa.

**4.3.5. Publications and awards in inter-institute events by students of the programme of study (3)**

(Instruction: The institution may provide a table indicating those publications, which fetched awards to students in the events/conferences organised by other institutes. A tabulated list of all other student publications may be included in the appendix.)

1. Students of the department participate each year in the National Design Contest 'INSDAG Steel Structure' organised at national level. Prizes have been won by



the students on several occasions. This year (2012-13) group including Jeni Jhavery, Pranit Mendu, Pinaki Mohanty won third Prize in this contest.

2. Mr. Saikiran Tharimena Won 1st Runner up prize in the Inter Collegiate Elocution Contest organised by Indian Space Research Organization, at MRSAC Nagpur, in 2011.

Thiyam Tamphasana Devi, Katpatal Y. B. (2011), Identification of potential infiltration zones through overlay analysis in GIS environment using reservoir frequencies, spreads and other parameters, Geospatial World forum 2011, Int. Con. Centre, Hyderabad, 18-21 Jan. 2011.

The student received '**Kamakshi Gold Medal**' on this paper based on her project work, the medal given as recognition of the Young Geospatial Scientist of the year.

Thiyam Tamphasana Devi, Katpatal Y. B. (2011) 'Estimation of Infiltration Rate by SCS-CN and CWC method using Satellite Data: A case study of Bhandara District, Maharashtra' 'International Conference on Sustainable Water Resource Management and Treatment Technologies'. **Water** 2011, Jan 19-22, 2011, IWA/NEERI Nagpur India.

Roy, S. and Katpatal, Y. (2011). "Cyclical Hierarchical Modeling for Water Quality Model-Based DSS Module in an Urban River System." J. Environ. Eng., 137(12), 1176-1184. doi: 10.1061/(ASCE)EE.1943-7870.0000441

Roy, Samapriya, Katpatal, Y.B, (2011) Non Transitive Modelling for Generating Hierarchical Model for an urban river system in India. Fourth International Perspective on Current & Future State of Water Resources & the Environment, EWRI-ASCE at NUS, Singapore, Jan 5-8, 2011.

Saikiran Tharimena and Katpatal Y.B. (2011), Knowledge Dissemination for Ground Water Recharge in an Urban area using Spatial Decision Support System, 3<sup>rd</sup> International Geography Congress, Kozhikode, Kerala 5-6 May 2011.

Saikiran Tharimena, Heena Gampawar, Katpatal Y. B. (2011) Environmental Impact Assessment (EIA) Based Studies of a Thermal Power Plant on the Hydrologic Regime Using Remote Sensing, **Geospatial World forum** 2011, Int. Con. Centre, Hyderabad, 18-21 Jan. 2011.

Roy, Samapriya, Katpatal, Y.B (2010), Status Monitoring of Nag River in Nagpur Urban Area in Central India with relation to Waste Water Management. Third International Perspective on Current & Future State of Water Resources & the Environment, EWRI-ASCE at IITM, Jan 5-7, 2010.

\*Ms. Vishakha V Sakhare, "Application of energy conservation measures for achieving functional comfort in built environment" Student got best M.Tech. Thesis Award evaluated by Chartered Institute of Building, London (2012).

Consortium Students have won the Best Business Plan Proposal Award at an event organized by Consortium-11.

## B5 Faculty Contributions

### 5. Faculty Contributions (175)

(Instruction: The institution may complete this table for the calculation of the student-teacher ratio (STR). Teaching loads of the faculty member contributing to only undergraduate programme (2nd, 3rd, and 4th year) are considered to calculate the STR.)

The information pertaining to the faculty contributions has been provided below. The table has been split into three tables giving separately the general information, the research publications and the R&D and Consultancy projects completed by the faculty members.

#### a. Faculty Contribution - General

List of Faculty Members: Exclusively for the Programme / Shared with other Programmes

Name of the faculty	Qualification, university, and year of graduation	Designation and date of joining the institution	Distribution of teaching load			Interaction with outside world
			1st Y	UG	PG	
V.A.Mhaisalkar	B.E(Civil Engg.) 1974. M.Tech (Env. Engg.) 1976. Ph.D. (Engg.) 1988	Professor 13 <sup>th</sup> September 1991	0	0	100	1.Member - Research Council (RC), CSIR-NEERI 2009 – 2012 2. Member -Panel on Water treatment Systems (P-06), Bureau of Indian Standards 2011 3. Member - Academic Council, BATU at Loner. 4.Member-R& R Committee of Rastrasant Tukdoji Maharaj Nagpur.
<b>P D Porey</b>		Professor		0	0	
<b>A. D. Pofale</b>				<b>50</b>	<b>50</b>	
Rajesh Gupta	B.E.(Civil) 1987 M.Tech (Env) 1990 PhD 1996	Professor 19.07.1993		<b>33</b>	<b>67</b>	1. Executive Committee of IWWA 2. Selection Committee Member of NEERI Nagpur 3. Selection Committee Member of Few Engineering Colleges in Maharashtra. 4. Expert member for curriculam Development, Engineering College

						Aurangabad.
<b>Y. B. Kapatal</b>	M.Tech. (1988), Ph.D (1992)  MBA 2002	Professor 29.07.1993		<b>75</b>	<b>25</b>	<ol style="list-style-type: none"> <li>1. Member- Board of Studies in Applied Sciences, RTNMU, Nagpur 2010 onwards</li> <li>2. Member - Selection panel for Class II Scientists, MPSC, Govt. of Maharashtra.</li> <li>3. Member - Executive Committee IWWA</li> <li>4. Member - External Curriculam revision Committee, NIT Raipur.</li> <li>5. Delivered 43 lectures on the invited forums as resource person/key note address/ expert lectures on several platforms.</li> <li>6. Reviewer of 6 International Journals</li> <li>7. Invited as Keynote Speaker/ Expert on various conferences/ forums</li> </ol>
<b>D.J.Katyanan</b>	B. E. Civil (1972)  M. Tech Civil (1974)	Associate Professor 01.07.1975		<b>67</b>	<b>33</b>	Coordinator State Technical Agency of PMGSY for 11 dist. of Maharashtra
<b>A.R.Tembhurkar</b>	B.E.(Civil) 1992 PGDBM 1993 M.Tech (Env) 1996 PhD 2006	Associate Professor 1.8.1996		<b>40</b>	<b>60</b>	<ol style="list-style-type: none"> <li>1. Hon Sec. Institution of Public Health Engineers, Maharashtra State</li> <li>2. Selection Committee members of Few Engineering Colleges in Maharashtra</li> <li>3. Expert Member for Curricula Development Nagpur University</li> <li>4. Technical Expert in Research and recognition Committee, North Maharashtra University Jalgaon</li> <li>5. Invited as Keynote Speaker/ Expert on various conferences/ forums</li> </ol>
<b>Dr. M.V.Latkar</b>	B.Sc.	Associate		<b>20</b>	<b>80</b>	

	(1985) M.Sc.(1987) PhD 1993	Professor 2.7.1994				
<b>V.S.Landge</b>	B.E.Civil (1991) M.E.Civil (1993) Ph.D. 2006	Associate Professor 15.06.1995		<b>33</b>	<b>67</b>	Co-Coordinator State Technical Agency of PMGSY for 11 dist. of Maharashtra
<b>A.D. Ghare</b>	B.E.(Civil) 1990 M.Tech (Hyd) 1997 PhD 2004	Associate Professor 31.7.2008		<b>33</b>	<b>67</b>	
<b>R V Ralegaonkar</b>	B.E.Civil (1998) M.E.Civil (2000) Ph.D. 2005	Associate Professor 01/12/2008		<b>33</b>	<b>67</b>	<ol style="list-style-type: none"> <li>1. American Journal of Energy Engineering, Science Publishing Group, New York, USA, 2012. (<a href="http://www.sciencepublishinggroup.com/journal/editorialboard.aspx?journalid=168">http://www.sciencepublishinggroup.com/journal/editorialboard.aspx?journalid=168</a>)</li> <li>2. International Journal of Sustainable Construction Engineering and Technology, PENERBIT, UTHM, Malasia, 2012. (<a href="http://penerbit.uthm.edu.my/ojs/index.php/IJSCET/about/editorialTeam">http://penerbit.uthm.edu.my/ojs/index.php/IJSCET/about/editorialTeam</a>)</li> <li>3. International Journal of Civil, Structural, Environmental and Infrastructure Engineering Research and Development, Trans-Stellar Journal Publications, 2012. (<a href="http://tjprc.org/journals.php?year=2012&amp;jtype=2&amp;id=11&amp;details=editors">http://tjprc.org/journals.php?year=2012&amp;jtype=2&amp;id=11&amp;details=editors</a>)</li> <li>4. International Journal of Forensic Engineering and Management, Inderscience Publishers, UK, 2012. (<a href="http://www.inderscience.com/jhome.php?jcode=ijfem#edboard">http://www.inderscience.com/jhome.php?jcode=ijfem#edboard</a>)</li> </ol>
<b>A Mondal</b>	B.E.Civil (1997) M.E.Civil (1999) Ph.D. 2007	Associate Professor 31/05/2012		<b>67</b>	<b>33</b>	
<b>D H Lataye</b>	B.E.(Civil) 1996	Assistant Professor		<b>33</b>	<b>67</b>	

	M.Tech (Env) 1998 PhD 2007	26/08/1998				
<b>A D Vasudeo</b>	B.E.(Civil) 1997 M.Tech (Hyd) 2004 PhD 2010	Assistant Professor 01/01/2000		<b>33</b>	<b>67</b>	
<b>S R Dongre</b>	B.E.(Civil) 2003 M.Tech (Env) 2006 PhD 2013	Assistant Professor 16/05/2006		<b>100</b>	<b>0</b>	
<b>S.P Wanzari</b>	B.E.(Civil) 1997 M.Tech (Const Mgt) 1999	Assistant Professor 18/05/2006		<b>33</b>	<b>67</b>	
<b>A G Tawalare</b>	B.E.(Civil) 1998 M.Tech (Str) 2000	Assistant Professor 15/01/2009		<b>67</b>	<b>33</b>	
<b>A. Patel</b>	B.E.(Civil) 2004 M.Tech (Geot) 2006 PhD 2009	Assistant Professor 28/05/2012		<b>100</b>	<b>0</b>	

#### **b. Faculty Contribution - Research Publications**

<b>Name of the faculty</b>	<b>Number of research publications in journals and conferences since joining (Year 2009 onwards)</b>
V.A.Mhaisalkar	<p><b>(a) Research Publications in International /National Referred Journals</b></p> <ol style="list-style-type: none"> <li>1) Padma S.Rao, V.A.Mhaisalkar, A Shrivastava, Animesh Kumar, T. Chakrabarti, S.Devotta, "Environmental Impact of Plantations in and around the Petroleum Refinery: A Case Study" Jour. of Environmental Monitoring and Assessment, July 2009, Springer.</li> <li>2) V.A. Mhaisalkar, Padma S. Rao, A. Shrivastava, Animesh Kumar, S. Devotta "Seasonal Variation of Ambient Levels of Sulphur dioxide in and around a Typical Indian Petroleum Refinery" International Journal of earth Sciences and Engineering ISSN 0974-5904, Vol. 02, No. 03, pp. 231-237, July 2009.</li> <li>3) Partha Chakravarty, V.A.Mhaisalkar and T.Chakrabarti, "Study on Polyhydroxyalkanoate (PHA) Production in Pilot Scale Continuous Mode Wastewater Treatment System" Jour. of Bioresource Technology 101(2010) 2896-2899.</li> <li>4) Padma S.Rao, D.Som, V.A.Mhaisalkar, A Shrivastava and S.Devotta "Hydrocarbons Emission Pattern in Indian Cities", Publication in book titled</li> </ol>

	<p>“Natural and Manmade Disasters : Vulnerability, Preparedness &amp; Mitigation”, published by MD Publications Pvt.Ltd., New Delhi 2010</p> <p>5) Padma S.Rao, V.A.Mhaisalkar and S.Devotta, “An Aproach for Estimating Green House Gas Emission Inventory and Modeling in a Petroleum Refinery”, Publication in book titled “ Natural and Manmade Disasters : Vulnerability, Preparedness &amp; Mitigation”, published by MD Publications Pvt. Ltd., New Delhi 2010</p> <p>6) V. A. Mhaisalkar, P. Gwala, S. Andey, P. Labhsetwar and C. Kshirsagar “Lab Scale study on Electro coagulation defluoridation process optimization along with aluminium leaching in the process and Comparison with Full Scale Plant Operation” Water Science &amp; Technology, 63.12, 201.</p> <p><b>(b) Research Publications in International Conferences/National Conference</b></p> <p>1) Abha P. Sargaonkar, P.S.Kelkar, V.A.Mhaisalkar and S.Devotta “Assimilative Capacity of Kanhan River near Nagpur Region (India) using MIKE-11” International Conference on Water, Environment, Energy and Society (WEES- 2009), New Delhi, January 12-16, 2009</p> <p>2) V.A. Mhaisalkar, “Environmental Impacts and Management of A Dam Project” National Seminar on Concrete Dam held at Institute of Engineers (I), Nagpur Centre on October 2-3, 2009</p> <p>3) Dhvani Gor and V.A. Mhaisalkar, “Cleaner Production Methods in Food Processing Industries” Presented at National Seminar on Cleaner Production Technology organized by NITTT&amp;R, Chandigarh, November 17-18, 2009</p> <p>4) P.Aswale, M.Karthik, T.Nandy and V.A.Mhaisalkar, “A Review o Technologies to Unleash power from Wastewater Methane Emissions” Indo - Italian Conference on Emerging Trends in Waste Management Technologie Organised at MIT, Pune, December 3-4, 2009</p> <p>5) V.A Mhaisalkar, Padma. S.Rao, S.Devotta and S.R.Wate “Emission Inventory and Modeling of a Petroleum Refinery: A Case Study” National Conference on Case Studies in Environmental Management, organized by VNIT, Nagpur, March 5-6, 2011 pp 151-156</p> <p>6) R. S. Bapat, R. V. Ralegaonkar and V. A. Mhaisalkar “Application of Water Conservation Technique to Low Income Group Housing”, National Conference on Green Energy and Water Management, March 16, 2012 organised by ITM, College of Engineering Nagpur.</p> <p>7) M. V. Rahate, P. Deshmukh, P.K. Labhasetwar, S. Shukla and V. A. Mhaisalkar “Low Cost Efficient Treatment for Contaminated Water” World Wide Workshop for Young Environmental Scientists at Paris during June 3-7, 2013 on ‘Urban Water, Resources, Risks’.</p>
<p><b>A. D. Pofale</b></p>	<p><b>(a) Research Publications in International /National Referred Journals</b></p> <p>1. Wanzari, S.P., Pophale, A D., Comparative Study of Bond Strength between Concrete and Reinforcement for various concrete grades of OPC and PCC by Pullout test, Frontiers of Structural and Civil Engineering” by Springer Link, DOI.1007/s11709-013-0193 published in Jan’2013</p> <p><b>(b) Research Publications in Internal Conferences/National Conference</b></p> <p>2. Wanzari, S.P., Pophale, A D. “The effect of variation of Steel fiber content in PPC Concrete on Bond stress between steel and Concrete without Transverse Reinforcement” in Proceedings of The First National Conference on “Recent Trends in Engineering &amp; Sciences” (NCRTES-2012) PIES, INDORE, 20-21 APRIL 2012.</p>

	<p>3. Wanzari, S.P., Pophale, A D. Comparative Study of Bond Strength of Plain Bar and TMT bar for various grades of Concrete by Pullout Test, Structural Engineering Convention at SVNIT Surat on 19-21st Dec'12</p> <p>4. Wanzari, S.P., Pophale, A D. Comparative study of Bond Strength between Concrete and Reinforcement for various grades of OPC and PPC Concrete with various diameters of TMT bar. International Conference on Civil Engineering at Tirupati , 7-8 Sept 2013.</p>
<p><b>Rajesh Gupta</b></p>	<p><b>(a) Research Publications in International /National Referred Journals</b></p> <ol style="list-style-type: none"> <li>1. Kotharkar, R., Deshpande, S.A., and Gupta, R., (2009). "Vernacular Courtyard housing pattern in <i>varhad</i> region of central India : A case for meaningful conservation", ABACUS, Journal on Architecture, Conservation and Urban Studies by Department of Architecture, Birla Institute of Technology, Mesra, Ranchi, Jharkhand, vol. 24, No 1, pp 58-71.</li> <li>2. Kotharkar, R., Deshpande, S.A., and Gupta, R., (2009). "Understanding Architectural expression", Architecture – Time space and people, vol. 9, issue 3, March 2009.</li> <li>3. Naik, U.S., and Gupta, R., (2009). "Optimal phasing of water transmission networks under fund constraint using Genetic Algorithm Technique" Journal of IWWA, April – June 2009</li> <li>4. Naik, U.S., Mahajan, M. M., and Gupta, R., (2009). "Thrust restraint design for above ground pipeline with Genetic Algorithm approach" Journal of IWWA, Oct – Dec 2009.</li> <li>5. Landge, H. C., Gupta, R., Katpatal, Y. B, (2010). "Regulation at local level for implementation of water supply projects through public-private partnership", Journal of IWWA, Jan – Mar 2010, 67-72.</li> <li>6. Gupta, R., Dhapade, S. and Bhave, P. R. (2012). "Water quality based reliability analysis of water distribution networks", Journal of ISH, August.</li> <li>7. Gupta, R., Vyas, J., Bhave, P.R., (2012). "Comparison of looped water distribution network designs for various like flow distribution models", Ingenieria Hydraulica y ambiental, Vol. 33, No. 3, 33-43.</li> </ol> <p><b>(b) Research Publications in Internal Conferences/National Conference</b></p> <ol style="list-style-type: none"> <li>1. Gupta R., Dhapade S., Bhave P. R. (2009). "Water Quality Reliability Analysis of Water Distribution Networks", International Conference on "Water Engineering for Sustainable Environment" organized by IAHR, Vancouver, Canada, 5607-5613.</li> <li>2. Dongre S., Gupta, R, and Bhave, P.R., (2009). "Uncertainty considerations in the design of water distribution network", 41<sup>st</sup> Annual convention of IWWA, Hyderabad, Jan 5 – 10, 2009.</li> <li>3. Dongre S., Gupta, R, and Bhave, P.R., (2010). "Optimal design of water distribution networks for uncertain demands", Proc. of National Conference on Sustainable development of urban infrastructure, Editors R. Gupta, et al., 212-223, 2010.</li> <li>4. Dongre, S, Gupta, R., and Bhave, P. R. (2010) "Optimal design of water distribution networks for uncertain demands", National Conference on Sustainable Development of Urban Infrastructure, organized by VNIT, Nagpur.</li> <li>5. Landge, H.C., Gupta, R., and Bhave, P.R., (2010) "Strategic model to implement Public Private Partnership in water sector in India" 11<sup>th</sup> International Conf. on "Improving Service Delivery in Water Supply", Mumbai, India. Page no. 69 – 72.</li> <li>6. Kotharkar, R., Deshpande S.A., and Gupta, R., (2010) "Vernacular Housing Design In Central India: Issues And Concerns For Today" ICSAUD 2010</li> </ol>

	<p>First International Conference Sustainable Architecture and Urban Design 2010, at School of Housing, Building and Planning, University Sains Malaysia, page no. 151 – 164.</p> <ol style="list-style-type: none"> <li>7. Dongre, S, Gupta, R., and Bhawe, P. R. (2011) “Elitism between successive runs for improving performance of GA based optimal design of water distribution networks”, International Conference on Sustainable Water Resource management and Treatment Technologies, organized by NEERI, Nagpur</li> <li>8. Dongre, S, Gupta, R., and Bhawe, P. R. (2011) “Least cost design of water distribution networks under uncertainty of nodal demands”, International Conference on Balance and Uncertainty, Brisbane, Australia.</li> <li>9. Rathi, S., and Gupta, R. (2011). “Identification of monitoring station in water distribution networks”, National conference Hydro 2011 organised by Indian Society for Hydraulics, Dec. 29-30, 2011.</li> <li>10. Gupta, R. and S. A. M., Abbas (2012). “Planning and Design of Large Regional Rural Water Supply Scheme”, Annual Convention of Indian Water Works Association, Raipur, Jan. 2012.</li> <li>11. Gupta, R., Hussain, A and Bhawe, P. R.(2012) “Water Quality Reliability Based Design of Water Distribution Networks.”, EWRI &amp; ASCE, Albuquerque, New Maxico, 355.</li> <li>12. Gupta, R., Dongre, S and Aditya Tyagi. (2013). “ Optimal Design of Level –I Redundant Water Distribution Networks with Fuzzy Demands”, EWRI &amp; ASCE, Cincinnati, Ohio,1382-1391.</li> </ol>
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<p><b>Y. B. Kapatal</b></p>	<p><b>(a) Research Publications in International /National Referred Journals</b></p> <ol style="list-style-type: none"> <li>1. Satapathy, D R, Salve Pradeep, Katpatal Y B (2009), Spatial distribution of metals in ground/surface waters in the Chandrapur district (Central India) and their plausible sources, Int. Journ. Environmental Geology (Feb. 2009), Vol.56, No.7, 1323-1352. (Springer)</li> <li>2. Vasudeo, A.D., Katpatal, Y.B., Ingle, R.N., (2009) “Uses of Dielectric Constant Reflection Coefficients for determination of groundwater using Ground-Penetrating Radar” World Applied Sciences Journal, 6(10): 1321-1325, 2009</li> <li>3. Katpatal, Y.B. and Patil, S.A. (2010), Spatial analysis on impacts of mining activities leading to flood disaster in the Eraiwatershed, India, J Flood Risk Management 3 (2010) 80–87.(Willy)</li> <li>4. Ranade P., Katpatal Y.B. (2007) GIS based qualitative analysis of Urban River Stream: A Case Study of Nag River Urban Watershed, District Nagpur, Maharashtra, India" URISA Journal online, Vol. 19,1,2007.</li> <li>5. Katpatal Yashwant B., Dube Y.A., (2010) Comparative Overlay Analysis through Analytical Hierarchical Process to Delineate Groundwater Potential Zones Using Satellite Data, International Journal of Earth Sciences and Engineering, ISSN 0974-5904 Volume 3, No. 5,October 2010, 638-653.</li> <li>6. Katpatal, Y.B., and Rama Rao, B.V.S., (2011). “Urban spatial decision support system for municipal solid waste management of Nagpur urban area using high resolution satellite data and Geographic Information System”,</li> </ol>
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7. Roy, S. and Katpatal, Y. (2011). "Cyclical Hierarchical Modeling for Water Quality Model-Based DSS Module in an Urban River System." J. Environ. Eng., 137(12), 1176–1184. doi: 10.1061/(ASCE)EE.1943-7870.0000441
8. Saklecha P.P., Katpatal Y.B., Rathore S.S., Agarawal D.K. (2011), 'Correlation of Mechanical Properties of weathered Basaltic Terrain for strength Characterization of foundation using ANN', International Journal of Computer Applications (0975 – 8887) Volume 33– No.10, November 2011, pp 7-12.
9. Saklecha P.P., Katpatal Y.B., Rathore S.S., Agarawal D.K. (2011), 'Spatial Correlation of Mechanical Properties of subgrade Soil for Foundation Characterization', International Journal of Computer Applications (0975 – 8887) Volume 33– No.10, December 2011.
10. Katpatal Y.B., Mhaisalkar V A, Mane Rohit ( 2012) "Conformal Analysis of Spatial shift in High Resolution Satellite Data (HRSD)" Int Journ of GIS April 2012, Journal of Geographic Information System, 2012, 4, 168-175.
11. Katpatal Y. B, Chavan C. S (2012), 'Study of groundwater level profile in an unconfined aquifer: Case study of Nagpur urban area, Central India' ; International Journal of Civil, Engineering (IJCE), ISSN: 2278-9987, Vol.1, Issue 2, Nov 2012 pp 25-33, © IASET.
12. Rajashree Vinod Bothale and Yashwant B. Katpatal 'Response of rainfall and vegetation to ENSO events during 2001 – 2011 in Upper Wardha watershed, Maharashtra, India' Journal of Hydrologic Engineering. Submitted December 13, 2012; accepted April 4, 2013; posted ahead of print April 5, 2013. doi:10.1061/(ASCE)HE.1943-5584.0000
13. Landge H C, Gupta, R., Katpatal Y.B., (2009) "Operation And Maintenance Cost Model For Implementing Water Supply Services Through Public Private Partnership In Developing Countries" Journal of IWWA, Vol. XXXX, No.3-4, pp 344-354.
14. Ranade,P., Katpatal Y.B., (2009) Water Resource Assessment and preparation of Management Planning Strategy using Remote Sensing and GIS in Indian Himalayas – A case study for Sainj River watershed, Himachal Pradesh,. Himalayan Studies Jour, Vol. 2 No. 1, pp 59-64.
15. Katpatal, Y.B., Mane Rohit, (2009) ' Optimizing errors in regional pipe network alignments using DGPS' journal of IWW, Vol. XXXXI No. 1, pp 51-58. Jan-Mar 2009.
16. Landge H C, Gupta R., Katpatal Y B, (2010), Regulation at Local level for implementation of Water Supply projects through public private partnership, Vol. 42; 1, ISSN 0970-275X, pp 67-73.
17. Mane V.P., Katpatal Y.B., (2009) Morphometric analysis of Bor river basin, Nagpur District, Maharashtra, India. Am. University Research Journal Vol IV (1), pp. 62-67, 2009.

**(b) Research Publications in Internal Conferences/National Conference**

1. Katpatal Y.B., Agrawal, D.K., Maskey, Sachin. (2009) "Land Degradability Assessment Due To Emerging Multimodal International Industrial Hub: A Spatial Approach" International Conference On Food Security And Environment Sustainability, IIT Kharagpur 17-19 Dec. 2009.
2. Gude, T., Mane, V., Katpatal Y.B., (2009) "Comparative spatial modeling for calculation of Runoff within Micro- watersheds over basaltic terrain" International Conference on Food Security and Environment Sustainability, IIT Kharagpur 17-19 Dec. 2009.
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7. Roy, Samapriya, Katpatal, Y.B, (2011) Non Transitive Modelling for Generating Hierarchical Model for an urban river system in India. Fourth International Perspective on Current & Future State of Water Resources & the Environment, EWRI-ASCE at NUS, Singapore, Jan 5-8, 2011.
8. Saikiran Tharimena, Heena Gampawar, Katpatal Y. B (2011) Environmental Impact Assessment (EIA) Based Studies of a Thermal Power Plant on the Hydrologic Regime Using Remote Sensing, Geospatial World forum 2011, Int. Con. Centre, Hyderabad, 18-21 Jan. 2011.
9. Thiyam Tamphasana Devi, Katpatal Y. B. (2011), Identification of potential infiltration zones through overlay analysis in gis environment using reservoir frequencies, spreads and other parameters, Geospatial World forum 2011, Int. Con. Centre, Hyderabad, 18-21 Jan. 2011.
10. Thiyam Tamphasana Devi, Katpatal Y. B. 'Estimation of Infiltration Rate by SCS-CN and CWC method using Satellite Data: A case study of Bhandara District, Maharashtra' "International Conference on Sustainable Water Resource Management and Treatment Technologies". Water 2011, Jan 19-22, 2011, IWA/NEERI Nagpur India

11. Saikiran Tharimena and Katpatal Y.B. (2011), Knowledge Dissemination for Ground Water Recharge in an Urban area using Spatial Decision Support System, 3rd International Geography Congress, Kozhikode, Kerala 5-6 May 201.
12. Vasudeo, A. D., Katpatal, Y.B., Landge, V.S., (2011) "HYDROLOGICAL ANALYSIS FOR A MINING BLOCK IN CHHATTISGARH STATE OF INDIA", ICWEE 2011: International Conference on Water, Energy and Environment, Phuket, Thailand, December 2011, organized by WASET.
13. Saklecha P.P., Katpatal Y.B., Rathore S.S., Agarawal D.K. (2012), Correlation of mechanical properties of foundation soil with CBR using regression analyses, International Conference on "ADVANCES IN MECHANICAL, MANUFACTURING AND BUILDING SCIENCES (ICAMB – 2012), School of Mechanical & Building Sciences, VIT University, Vellore, TN, India, 2012.
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17. Rajashree Vinod Bothale, Y B Katpatal, ( 2012), 'Satellite Remote Sensing in Monitoring the Impact of climatic variability', International Symposium on ' India Water Week' New Delhi, 2012.
18. Shirkhedkar S.S. Yashwant B. Katpatal , S.S. Rathore. (2012) 'CRITICAL ANALYSIS OF PRESENT STATUS OF SEISMIC RISK ZONES IN INDIA'. International Conference on Earthquake resistant construction practices, ICEQRCP 2012, Department of Civil Engineering, Dr. M.G.R. EDUCATIONAL & RESEARCH INSTITUTE UNIVERSITY, July 27th-28th, 2012, Chennai, INDIA.
19. Katpatal Yashwant B., Shirkhedkar S.S., Dr. S.S. Rathore, (2012)' Analysis of Rock Seismicity and present Seismic risk zones within India', 2ND Int. Conf on Civil Engineering, Tirupati, India Sept 7-9, 2012.
20. Bothale Rajashree Vinod and Katpatal Yashwant B. (2013) EL Nino and La Nina IMPACT on RESPONSE OF WATERSHED 35th International

Symposium on Remote Sensing of Environment (ISRSE35) Theme Earth Observation and Global Environmental Change- 50 years of Remote Sensing, 22-26 April, 2013, Beijing China.

21. Y.B. Katpatal , S.S. Rathore, S.S.Shirkhedkar , Influence of Engineering rock properties and historical ground shaking indicators on Seismic microzonation of India. 75th EAGE Conference & Exhibition incorporating SPE EUROPEC 2013  
London, UK, 10-13 June 2013.
22. Katpatal Y.B., Lamsoge B., Pophare A.M., (2009), A reveiw on Designing a restoration Model for an Over Exploited watershed, National Workshop on “ Groundwater Resources Management in Maharshtra”, 3-4 March 2009, Central Groundwater Board, Nagpur.
23. Agrawal, D.K., Katpatal Y.B. ( 2009), “Groundwater Recharge Plan in Wardha district of Maharashtra using Analytical Hierarchy Process based modeling using Geographical Information System” National Symposium, ISRS, Nagpur, Sept. 2009.
24. Katpatal Y.B., Maskey Sachin ( 2009), “Spatial analysis for assessing Impacts of Special Industrial Zones on agricultural land loss through proximity analysis of high resolution RS data ” National Symposium, ISRS, Nagpur, Sept. 2009.
25. Vasudeo, A.D.,Katpatal Y.B., Ingle, R.N. ( 2009), “Variations In Radar Footprints And Refraction Coefficients With Depth Of Signal Penetration In Ground Penetrating Radar Survey For Locating Groundwater ” National Symposium, Isrs, Nagpur, Sept. 2009.
26. Patil, S.A., Katpatal Y.B., (2009), “Spatial Analysis and Impact Assessment of Agriculture in Erai Watershed of Chandrapur district, Maharashtra,” National Symposium, ISRS, Nagpur, Sept. 2009.
27. Rathore S.S. , Katpatal Y.B., Agrawal D.K., Saklecha P.P. (2009), “Artificial neural network and its application in geomechanics” National Conference on Advance trends in engineering and Management Technologies’ 20-21 Nov, 2009, IEEE ISTE sponsored, RKNEC, Nagpur.
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	<p>of Chandrapur Super Thermal Power Station Ash Pond Using Geomatics Approach”, UGC Sponsored national Seminar on ‘ Recent Trends in Bio-Geo Sciences’ 14th Oct., 2010, SM Mohota Science College, Nagpur.pp 97-100.</p> <p>34. Katpatal Y.B., (2010) “Geoinformatics for Knowledge Visualization and Policy formulations for Resources Management”, UGC Sponsored national Seminar on ‘ Recent Trends in Bio-Geo Sciences’ 14th Oct., 2010, SM Mohota Science College, Nagpur. Pp.22-23</p> <p>35. Katpatal Y. B., Chavan C. S., Johnson K. (2011), ‘Case study on change in vegetation in Nagpur Municipal area in relation to urban sprawl during 2000-2010 using satellite data’, National Conference on Case Studies in Environmental Management, March 5-6, 2011, Org. VNIT &amp; IAEM, Nagpur ,pp 277-281.</p> <p>36. Patil S.A, Katpatal Y. B., (2011), ‘Spatial Approach for impact assessment of Chandrapur Thermal Power Station Ash Pond, Maharashtra India’, National Conference on Case Studies in Environmental Management, March 5-6, 2011, Org. VNIT &amp; IAEM, Nagpur.pp269-276.</p> <p>37. Saklecha P.P., Katpatal Y.B., Rathore S.S., Agarawal D.K. (2011), Prediction of CBR value of subgrade soil using ANN, National Conference on Geotechnical Engineering, SVNIT, Surat Gujarat, 9-10 Oct. 2011.</p> <p>38. Rajashri V. Bothale, Katpatal Y B ( 2012), ‘Impact of Climate variability on Rainfall and vegetation in watershed’, National Symposium on Space Technology for Food and Environmental security, ISRS, Dec. 5-6, 2012, PUSA New Delhi.</p> <p>39. Tausif A. Ansari, Katpatal Y B ( 2012), ‘GIS based SCS CN runoff model of Nagpur Urban Area ’, National Conference on RS and GIS Applications, 13th ESRI India User Conference , Dec. 5-6, 2012, Radisson Blu, New Delhi.</p> <p>40. Katpatal Y.B., (2013)‘ Geoinformatics Applications in Watershed Studies’.UGC Sponsored National Conference on “Watershed Management for Sustainable Development, WMSD 2013” Organized by Department of Geology, Amravati University in Collaboration with Central Groundwater Board and Groundwater Survey and Development Agency. on 22nd- 23rd Feb 2013 at Amravati.</p>
<b>D.J.Katyanan</b>	Not available for last three years
<b>A.R.Tembhurkar</b>	<p><b>(a) Research Publications in International /National Referred Journals</b></p> <ol style="list-style-type: none"> <li>1. Arti Prasad , Dr. A.R. Tembhurkar, “ Development of Software for Selection of Optimal Site for Wastewater Treatment Plant Using Concept of Dominance Matrix” Jour. IAEM Vol. 36(1) Feb. 2009, 21-26.</li> <li>2. A.R.Tembhurkar, Shilpa Dongre “Comparative Studies on Flouride Removal Using Natural Adsorbents viz. Azadirachta Indica (Neem) and Ficus Religiosa (Pipal)”. Journal of Institution of Engineers, Vol. 90, Sept. 2009.</li> <li>3. B. V. Khode, A. R. Tembhurkar, P. D. Porey and R. N. Ingle, “ Improving Discharge Capacity over Spillway by Labyrinth Weir” World Applied Science Journal 10(6), 709-714, 2010</li> <li>4. B.V. Khode, A. R. Tembhurkar. “Evaluation and Analysis of Crest Coefficient for Labyrinth weir,” Journal of World Applied Science 11</li> </ol>

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5. B.V. Khode, A. R. Tembhurkar, P. D. Porey, R. N. Ingle. "Experimental Studies For Improvement In Discharge Capacity Of Open Spillway By Labyrinth Weir" Journal of Indian Water Work Association. 42 (1) Jan Feb 2010
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8. B.V. Khode, A. R. Tembhurkar, P. D. Porey, R. N. Ingle, "Experimental Studies On Determination Of Discharge Coefficient For Flow Over Trapezoidal Labyrinth Weir," International Journal of Civil Engineering Research & Technology. 4(1),47-54,(2011)
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9. Dr. A.R. Tembhurkar, Arti Prasad , " Decision Making Software Effective Selection of Treatment Train Alternative for Wastewater Using AHP" Jour. IESE Vol. ( ) Feb. 2011, -(In Press)
10. Shilpa Tiwari, Dr. A.R. Tembhurkar, " Laboratory Studies on Filtrations Unit with Foam and Sand as Dual Media" International Research Journal of Lab to Land Vol 2(8) Oct 2010, ISSN 0975-282x.
11. Dr. A.R.Tembhurkar, Radhika Deshpande " Powdered Activated Lemon Peels as Adsorbent for Removal of Cutting Oil from Wastewater" Jour. of Hazardous, Toxic and Radioactive Waste, American Society for Civil Engineers, Vol 16, No 4 Oct 2012
12. B.V. Khode, A. R. Tembhurkar, P. D. Porey, R. N. Ingle(2012) " Experimental studies On Flow Over Labyrinth Weir", American Society of Civil Engineering, Journal of Irrigation and Drainage Engineering ,138(6), 548-552
13. Idris Ahmed and A. R. Tembhurkar, ""Assessment of Noise Pollution in a School Building –A Case Study" International Research Journal of CBSS Vol II, issue 1(I), April 2013.

**(b) Research Publications in Internal Conferences/National Conference**

1. Mrs. Kalpana Bhole Dr. Ajay Tembhurkar Dr. Sanjay Dahasahasra , " 24x7 Water Supply for Amravati City- Transformation using Hydraulic Model' 11th International Conference " Improving Service Delivery in Water Supply" Thane 8-9 Jan 2010
2. V. D. Salkar, A. R. Tembhurkar, S. V. Ranade , "Management of Typical Filtration Systems in Urban Water Treatment Plants". National Conference on Case Studies in Environmental Management, VNIT, Nagpur, 5-6 March, 2011
3. Kalpana Bhole, Ajay Tembhurkar, Sanjay Dahasahasra, V. N. Rathod, " Rehabilitation Plan of Water Distribution Network of Operational Zone for Continuous Water Supply: A Case Study of VMV Zone". National Conference on Case Studies in Environmental Management, VNIT, Nagpur, 5-6 March, 2011
4. R. D. Jadhav, A. R. Tembhurkar, Rajesh Gupta, "Computer Aided Hydraulic Design Of Small Capacity Water Treatment Plant" International Conference on "Sustainable Water Resource Management and Treatment Technologies"

	<p>NEERI, Nagpur, 19-22 Jan 2011</p> <ol style="list-style-type: none"> <li>Dr A. R. Tembhurkar, Adil Mohammed, “ Drinking Water –Heath and Economy” at 24th National Convention of IPHE on ‘Water and Sanitation Utility Services in India and Their Heath Implications’ 12-13th Feb 2011, Bhubaneshwar</li> <li>V. D. Salkar, A. R. Tembhurkar, S. V. Ranade, “<b>Significance of Flow and Head-loss measurements in Filtration Systems</b>” flotekg-2012 (Global Conference and Exhibition) on Smarter &amp; Greener Flow Measurement and Control at FCRI, Palakkad, Kerala. jan 18-20th 2012</li> <li>Salkar V. D., Dr. A. R. Tembhurkar, S. V. Ramchandre, “Back Flushing Routine for Enhanced Performance of Upflow Gravity Filter” National Seminar on Recent Practises and Application in Civil Engineering at Walchand College of Engineering, Sangli 31st May – 1st June 2013</li> </ol>
<b>Dr. M.V.Latkar</b>	Not avaiable for last three years
<b>V.S.Landge</b>	<p><b>(a) International Journal / National Journals</b></p> <ol style="list-style-type: none"> <li>Vivek S. Hokam, Dr. V. S. Landge, “An Overview Of Pavement Management System For Industrial Area”, International Journal of Engineering Research and Applications (IJERA) ISSN: 2248 -9622 ,(2013)</li> <li>A.K.Sharma; V.S.Landge;, “Zero Inflated Negative Binomial For Modeling Heavy Vehicle Crash Rate On Indian Rural Highway”, International Journal of Science and Advanced Technology (ISSN 2221- 8386) Volume 2 No 8 August 2012</li> <li>A.K.Sharma; V.S.Landge; N.V.Deshpande, “Modeling Motorcycle Accident on Rural Highway International Journal of Chemical, Environmental &amp; Biological Sciences (IJCEBS)Volume 1, Issue 2 (2013) ISSN2320 –4087</li> </ol>
<b>A.D. Ghare</b>	<p><b>(a) Research Publications in International/National Referred Journals G</b></p> <ol style="list-style-type: none"> <li>D Kale, A D Ghare, (2009) K A Patil Simplified Procedure for Computation of Rainstorm Kinetic Energy The IUP Journal of Soil and Water Sciences, II, No. 3, pp.39-47</li> <li>P.L. Patel, P. D. Porey, A D Ghare, S. B. Patel (2009)Entrainment Characteristics of Nonuniform Unimodal and Bimodal Sediments, Journal of Korean Society of Civil Engineers, KSCE</li> <li>13(3), pp 189-194</li> <li>A D Ghare, P D Porey, R N Ingle, S S Gokhale ( 2010) Block Ramp Design for Efficient Energy Dissipation Journal of Energy Engineering, ASCE, 136, No. 1, pp 1-5</li> <li>A M Badar, A D Ghare (2012) Development of Discharge Prediction Model for Trapezoidal Canal using Simple Portable Flume, International Journal of Hydraulic Engineering, Scientific &amp; Academic publishing, USA, 1, No.5, pp 37-42.</li> </ol> <p><b>(b) Research Publications in Internal Conferences/National Conference</b></p> <ol style="list-style-type: none"> <li>A M Badar, Abhijit Lade, A D Ghare (2011) Measurement of flow using cylindrical flume in rectangular channel, Vth World AQUA Congress (International) 16.11.2011to 18.11. 2011 New Delhi.</li> <li>A M Badar, A D Ghare ( 2012) Hydraulic Characteristics of a Cylindrical Flume for a Rectangular Canal, SPICON 12, (International) 31.05.2012to</li> </ol>

	<p>2.06.2012, SPCE, Andheri, Mumbai.</p> <ol style="list-style-type: none"> <li>3. R V Ralegaonkar , A D Ghare, M. Bhagat ( 2009) Spatial Planning of Buildings and Infrastructure for Disaster Management, National Seminar on Research Activities in Disaster Mitigation for Housing in India (HDMR-09), 22.08.2009 to 23.08.2009</li> <li>4. IIT Roorkee (Centre of Excellence in Disaster Mitigation and Management)</li> <li>5. R R Gawalpanchi, A D Ghare ( 2009) Environmental effects due to construction of Concrete Dams, All India Seminar on Concrete Dams, The Institution of Engineers (India), Nagpur Centre.</li> <li>6. M. Badar, A. D. Ghare (2010) Prediction of Discharge through Trapezoidal Channel with Cylindrical Flume, National Conference on Hydraulics, Water Resources and Environment 'HYDRO 2010', M. M. University, Ambala, Haryana</li> <li>7. Bhagat M. S. , Ghare A. and Ralegaonkar R.V. (2011) Long Term Strategy for Flood Hazard Management, National Conference on Water for Future 'NCWF 2011', 25th – 26th February 2011, SGGS Institute of Engineering &amp; Technology, Nanded</li> <li>8. D. Lade, A. M. Badar, A. D. Ghare (2011) Mathematical Model Analysis for Simple Cylindrical Flume, National Conference on Hydraulics, Water Resources 'HYDRO 2011' 29.12.2011 to 30.12.2011, SVNIT, Surat</li> <li>9. K. M. Bhartiya, A. D. Ghare, S. S. Gokhale ( 2011) Simplified Reference Evapotranspiration Model for Nagpur Region, National Conference on Hydraulics, Water Resources 'HYDRO 2011' 29.12.2011 to 30.12.2011, SVNIT, Surat</li> <li>10. Ms. M. S. Bhagat, A. D. Ghare, R. V. Ralegaonkar (2011) Estimation and Zoning of Flood Vulnerable Areas using Multicriteria Analysis, National Conference on Hydraulics, Water Resources 'HYDRO 2011' 29.12.2011 to 30.12.2011, SVNIT, Surat</li> <li>11. K. M. Bhartiya, A. D. Ghare ( 2012) Comparative Study of Simplified Reference Evapotranspiration Models, National Conference on Hydraulics, Water Resources 'HYDRO 2012', IIT Bombay, Mumbai, pp 163-172.</li> <li>12. M. Badar, A. D. Ghare (2012) Discharge Relationships for Simple Cylindrical Flumes in Trapezoidal Channel Section, National Conference on Hydraulics, Water Resources 'HYDRO 2012', IIT Bombay, Mumbai, pp 331-338.</li> <li>13. S.Pote, A. D.Ghare, B. V.Khode ( 2012) Relative Residual Energy of Labyrinth Weirs, National Conference on Hydraulics, Water Resources 'HYDRO 2012' IIT Bombay, Mumbai, pp 1073-1078</li> </ol>
<p><b>R V Ralegaonkar</b></p>	<p><b>(a) Research Publications in International /National Referred Journals</b></p> <ol style="list-style-type: none"> <li>1. Rahul V Ralegaonkar, Vishakha V Sakhare (2013) <i>Development of multi-parametric functional index model for evaluating the indoor comfort in built environment</i>, International Journal of Indoor and Built Environment, Sage Publication, Accepted.</li> <li>2. Chetan S Dhanjode, Rahul V Ralegaonkar, Vaidehi A Dakwale (2013) <i>Design and development of sustainable construction strategy for residential buildings: a case study for composite climate</i>, International Journal of</li> </ol>



- Sustainable Construction Engineering & Technology, Volume 4, Issue 1, pp. 12-20.
3. Mangesh V Madurwar, Rahul V Ralegaonkar, Sachin A. Mandavgane (2013) *Application of agro-waste for sustainable construction materials: A Review* International Journal of Construction & Building Materials, Elsevier, Volume 38, pp. 872-878.
  4. S.P. Raut, R.V. Ralegaonkar and S.A. Mandavgane (2013) *Utilization of recycle paper mill residue and rice husk ash in production of light weight bricks* International Journal of Archives of Civil and Mechanical Engineering, Elsevier, Volume I 3, pp. 269-275.
  5. D. Rajput; S. S. Bhagade; S P Raut, R.V. Ralegaonkar; Sachin A. Mandavgane (2012) *Reuse of cotton and recycle paper mill waste as building material* International Journal of Construction & Building Materials, Elsevier, International Journal of Construction & Building Materials, Elsevier, Volume 34, pp. 470-475.
  6. S.P. Raut, Rohant Sedmake, Sunil Dhunde, R.V. Ralegaonkar and S.A. Mandavgane (2012) *Reuse of Recycle Paper Mill Waste in Energy Absorbing Light Weight Bricks* International Journal of Construction & Building Materials, Elsevier, Volume 27, pp. 247-251.
  7. Vaidehi Dakwale and Rahul Ralegaonkar (2012) *Review of Carbon Emission through Buildings: Threats, Causes and Solution* International Journal of Low-Carbon Technologies, Oxford Journals, Volume 7 (2), pp. 143-148.
  8. Vaidehi Dakwale, Rahul Ralegaonkar and S.A. Mandavgane (2011) *Improving environmental performance of buildings using energy efficiency approach: A review*, Sustainable Cities and Society, Elsevier, Issue 1, pp. 211-218.
  9. Ralegaonkar R. V. (2011) *Spatial Indexing of Buildings for Disaster Management*, International Journal of Civil Engineering and Architecture, David Publishing, USA, July 2011, Volume 5, No. 7 (Serial No. 44), pp. 655-659
  10. Gireedhari Patle, Vaidehi Dakwale & Rahul Ralegaonkar (2011) *Design of Green Building: A Case Study for Composite Climate* International Journal of Engineering Research and Applications, Vol. 1, Issue 2, pp.388-395.
  11. Ralegaonkar R. V. & Gupta R. (2011) *Evaluation of a New Static Sunshade for Composite Climate using Experimentation*, International Journal of Engineering Research and Applications, Vol. 1, Issue 2, pp.251-258.
  12. S.P. Raut, R.V. Ralegaonkar and S.A. Mandavgane (2011) *Development of Sustainable Construction Material Using Industrial and Agricultural Solid Waste: A Review of Waste-Create Brick*, International Journal of Construction & Building Materials, Elsevier, 25, 10 :4037-4042.
  13. Rahul V. Ralegaonkar and Rajiv Gupta (2010) *Performance Evaluation of A Climate Responsive Static Sunshade using Experimentation*. Built Environment Journal, 7, 2: 21-40.
  14. Ralegaonkar R. V. & Gupta R. (2010). *Review of Intelligent Building Construction: A Passive Solar Architecture Approach*. International Journal of Renewable and Sustainable Reviews, Elsevier, 14:2238-2242.
  15. Rahul V. Ralegaonkar, Rajiv Gupta (2010) *Application of Passive Solar Architecture for Intelligent Building Construction: A Review*. International Journal of Energy, Education, Science and Technology, Turkey, 26(1): 75-85.
  16. Bapat R S, Ralegaonkar R. V. & Mhaisalkar V. A. (2012) *Energy Management in Educational Buildings using Sustainable Technology*. Journal of Energy and Fuel user's Association of India, LXII-1, 1-4.

17. Bambawale R., Nathane P., Ahmad Z. Dakwale V A & Ralegaonkar R V (2011) Improving Thermal Performance & Energy Efficiency of Building System by Simulation Approach Journal of Energy and Fuel user's Association of India, LXI-2, 1-5.
18. Ralegaonkar R. V. (2010) Thermal Performance Assessment of Building System by Software Approach Architectural Engineering Journal, Institution of Engineers, India,91 (Pt: AR/2), 19-23.
19. Ghuge V., Bharat A. & Ralegaonkar R V (2010) Understanding thermal comfort in Urban Outdoor Spaces: a literature review Architecture Time Space & People; The Magazine of the Council of Architecture, India 20-22.
20. Ralegaonkar R. V. & Ghuge V. (2010) Policies and Tools for Shadow Analysis of a Green Neighbourhood. Journal of Energy and Fuel user's Association of India, LX-1, 35-37.

**(b) Research Publications in Internal Conferences/National Conference**

1. R V Ralegaonkar (2012) Renewable Energy Sources & Prospective, International Conference on Novel Horizons & Prospects of Industry Institute Interaction, 5-6 February, Agnihotri College of Engineering, Wardha, India
2. S. P. Raut, R V Ralegaonkar & Sachin A. Mandavgane (2011) Application of Industrial Waste for Developing Energy Efficient False Ceiling Panels, International Congress on Environmental Research, 15-17 December, SVNIT, Surat, India.
3. Rahul V Ralegaonkar, Sachin A Mandavgane, Divya Kalakuri, Raveesh Jaiswal, Samta Kubde & Ankur Kurmi (2011). Application of Reflecting cum Insulating Material for Energy Conservation in the Built environment. IIIrd International Conference on "Advances in Energy Research, 9-11 December, Indian Institute of Technology Bombay, Powai, Mumbai, India
4. Rahul V Ralegaonkar, Prateek, Vishakha, Murlidhar & Anant Lal (2011). Quality Assessment for Climate Responsive Built Environment. International Conference on Advances in Materials and Techniques for Infrastructure Development, 28-30 September, NIT Calicut, India.
5. Vidya Ghuge, Alka Bharat & Rahul V Ralegaonkar (2011). Proposing a Methodology for Working out Thermal Sensation in an Urban Outdoor Space, Nagpur. International conference on Healthy Cities: Perspective on Asian Concerns, 3rd-5th February, Dr B N College of Architecture for Women Pune, India
6. Rahul V Ralegaonkar, Sachin A Mandavgane, Vaidehi A. Dakwale & S P Raut (2011) Review of Sustainable Construction Materials using Nanotechnology. India International Energy Summit, 28-30 January, VNIT, Nagpur, India
7. Rahul V Ralegaonkar, Sachin A Mandavgane, Vaidehi A. Dakwale & S P Raut (2011) Performance Evaluation of Energy Efficient Waste-create Bricks India International Energy Summit, 28-30 January, VNIT, Nagpur, India
8. Rahul V Ralegaonkar & A D Ghare (2011). Flood-proof assessment of buildings using spatial indexing approach. International Perspective on Water and Environment, 4-6 January, NUS, Singapore.
9. Ashwini Yelchatwar; Anup Jangada; Rahul Ralegaonkar; Vasant A. Mhaisalkar (2011). Cost Minimization Approach for Solid Waste Collection Using Network Analysis. International Perspective on Water and Environment, 4-6 January, NUS, Singapore.
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	<p>indexing approach for earthquake risk management. RICS, COBRA 2010, London, 2010. ISBN: 9781842196199</p> <ol style="list-style-type: none"> <li>11. Mandavgane S. A. &amp; Ralegaonkar R. V. (2009). Application of Industrial Waste in making High Performance Bricks. International Conference on Waste to Wealth, BMTPC, New Delhi. 12-13 Nov. 2009</li> <li>12. S. P. Raut, R V Ralegaonkar &amp; S. A. Mandavgane (2012) Strength Study of Light-Weight Recycle Paper Mill Waste Bricks- National conference on recent advances in chemical and environmental engineering, 20-21 January, NIT, Rourkela.</li> <li>13. Madurwar M V, Ralegaonkar R V &amp; Mandavgane S. A. (2011) Application of Agro-waste for Eco-friendly Construction Materials- National Seminar on Modern Construction Management Practice- Challenges faced by Mega Projects, , December 17-18, Institution of Engineers, Pune.</li> <li>14. Bapat R S, Ralegaonkar R V &amp; Mhaisalkar V A (2011) Application of Energy Efficient Techniques for Mega Projects- National Seminar on Modern Construction Management Practice- Challenges faced by Mega Projects, , December 17-18, Institution of Engineers, Pune.</li> <li>15. Bhagat M., Ghare A. D. &amp; Ralegaonkar R. V. (2011) Long Term Strategy for Flood Hazard Management- National Conference on Water for Future 25-26 Feb. 11, SGGI IET, Nanded.</li> <li>16. Ralegaonkar R. V., Ghare A. D. &amp; Bhagat M. (2009) Spatial Planning of Buildings &amp; Infrastructure for Disaster Management. National Conference on RESEARCH ACTIVITIES IN DISASTER MITIGATION FOR HOUSING IN INDIA (HDMR-2009), 22-23 August, IIT, Roorkee.</li> <li>17. Ralegaonkar R. V (2009) Performance Evaluation of Building System with the aid of TRANSYS Software. National Conference on Recent Trends &amp; Challenges in Civil Engineering, 18-19 December, KITS, Ramtek.</li> </ol>
<p><b>A Mondal</b></p>	<p><b>(a) Research Publications in International /National Referred Journals G</b></p> <ol style="list-style-type: none"> <li>1. Mandal, A., Baidya, D.K., D. Roy, (2010) “Experimental Evaluation of Vertical Response of Rigid Surface Footing on Layered Soil.” Int. Journal of Geotechnical Engineering, volume 4, issue 1.</li> <li>2. Mandal, A. C. P. Chakravarthy, R. Rath, A. Nanda and A. Usmani (2011), “Analysis and Design Approach of Large Storage Caverns”, (In Press), Int. Journal of Geomechanics, ASCE. doi:10.1061/(ASCE)GM.1943-5622.0000180</li> <li>3. A.Usmani, A., Nanda, S.K.Jain and A. Mandal (2011), “Analysis and Design of an Underground Portal in Lateritic Soils” Journal of Geotechnical and Geological Engineering (Springer), DOI 10.1007/s10706-012-9494-5.</li> <li>4. Mandal, A., D. K. Baidya and D. Roy, Dynamic Response of the Foundations Resting on a Two-layered Soil Underlain by a Rigid Layer, Journal of Geotechnical and Geological Engineering (Springer), DOI: 10.1007/s10706-012-9497-2.</li> </ol> <p><b>(b) Research Publications in Internal Conferences/National Conference</b></p> <ol style="list-style-type: none"> <li>1. Mandal, A., Chakravarthy, C.P., Nanda, A., Rath, R. and Jain, S.K. (2010). Analysis and design of large storage caverns. Proc., 6th Asian Rock Mechanics Symposium, International Society for Rock Mechanics (ISRM), Delhi, India.</li> </ol>

	<p>2. Kumar C., Mandal, A., Nanda A., and Jain S. K. (2012). "Stability Analysis of Large Wedge in Underground Openings. Indian Geotechnical Conference 2012, New Delhi.</p>
<p><b>D H Lataye</b></p>	<p><b>(a) Research Publications in International /National Referred Journals G</b></p> <ol style="list-style-type: none"> <li>1. Lakshmi U. R., Mall I. D., Srivastava V. C., Lataye D. H. Rice husk ash as an effective adsorbent: Evaluation of adsorptive characteristics for Indigo Carmine Dye. <i>J. Environ. Manage.</i>, 90(2) (2009) 710-720.</li> <li>2. Lataye D. H., Mishra, Indra M., Mall, Indra D. Adsorption of <math>\alpha</math>-picoline on granular activated carbon and rice husk ash from aqueous solution: equilibrium and thermodynamic study, <i>Che. Eng. J.</i> 157 (2009) 139-149.</li> <li>3. Lataye D. H., Mishra, Indra M., Mall, Indra D. Multicomponent Sorption of Pyridine and its Derivatives from Aqueous Solution onto Rice Husk Ash and Granular Activated Carbon. <i>ASCE: Practice Periodical of Hazardous, Toxic, and Radioactive Waste Management</i>, 18(4) (2009) 218-228.</li> <li>4. Lataye D. H., Mishra, Indra M., Mall, Indra D. Removal of 4-Picoline from Aqueous Solution by Adsorption onto Bagasse Fly Ash and Rice Husk Ash: Equilibrium, Thermodynamic and Desorption Study. <i>ASCE: Journal of Environmental Engineering</i>, 137 [11] (2011) 1048-1057.</li> <li>5. Rai S., Wasewar K.L., Lataye D.H., Mishra R.S., Puttevar S.P., Chaddha M.J., Mahindran P., Mukhopadhyay J. Neutralization of red mud with pickling waste liquor using Taguchi's design of experimental methodology. <i>Waste Manag Res.</i> (2012), doi: 10.1177/0734242X12448518.</li> <li>6. Rai S., Wasewar K.L., Lataye D.H., Mukhopadhyay J., Yoo C.K. Feasibility of red mud neutralization with sweater using Taguchi's methodology. <i>Int. J Environ. Sci. Technology</i>. DOI: 10.1007/s13762.012.0118.7.</li> <li>7. Singh Kalpana, Lataye Dilip H., Wasewar Kailas, Chang Kyoo Yoo. Removal of fluoride from aqueous solution: status and techniques. <i>Desalination and Water Treatment</i>. 51, (2013) 3233-3247. DOI: 10.1080/19443994.2012.749036.</li> </ol> <p><b>(b) Research Publications in Internal Conferences/National Conference</b></p> <ol style="list-style-type: none"> <li>1. Keerty Praveena, Lataye D.H., Latkar M.V. Utilisation of Fly Ash in Treatment of Leachate. International Conference on "Environmental Pollution, Water Conservation and Health (ICEPWCH-2010)" Organized by the Department of Zoology, Bangalore University, Jnana Bharathi, Bangalore-560 056, India In Association with Indian Society of Comparative Animal Physiology (ISCAP), Tirupati-517 502, Andhra Pradesh, India during July 29-31, 2010, Bangalore, India.</li> <li>2. Lataye D. H., Mishra, Indra M., Mall, Indra D. Application of Taguchi design of experiment technique for adsorption of pyridine onto bagasse fly ash. <i>Colloids and Materials 2011, The 1st International Symposium on Colloids and Materials: New Scientific Horizons Amsterdam, The Netherlands, May 8-11, 2011.</i></li> <li>3. Waghmare S.S., Manwar Nilesh, Lunge Sneha, Labhsetwar Nitin, Lataye Dilip H., Rayalu Sadhna. Composite type adsorbent materials for defluoridation of water, International Conference on New Age Science &amp; Technology for Sustainable Development Organised by NEERI in Association with Indian JSPS (Japan Society for the Promotion of Science) Alumni Association at Nagpur, August 7-8, 2012.</li> <li>4. Rai S., Wasewar K.L., Lataye D.H., Mishra R.S., Chaddha M.J., Mukhopadhyay J. Intensifying approaches for neutralization of red mud. International</li> </ol>

	<p>Symposium – Bauxite, Alumina and Aluminium Industry of Asia, IBAAS-2012, Hotel Blu Radisson Nagpur, December 3-5, 2012.</p> <ol style="list-style-type: none"> <li>5. Varhade R.P., Lataye D.H. Comparative Study on the Performance of Various Electrodes for Removal of COD from Sugar Mill Wastewater. International Conference on Advances in Chemical Engineering organized by Department of Chemical Engineering, NIT Raipur, India, April 5-6, 2013.</li> <li>6. Varhade R.P., Lataye D.H. Effect of current density on removal of COD from Sugar mill waste water using SS and Al Electrodes. International Conference on Future Trends in Structural, Civil, Environmental and Mechanical Engineering FTSCEM – 2013, Bangkok, Thailand, July 13-14, 2013.</li> </ol>
<b>A D Vasudeo</b>	<p><b>(a) Research Publications in International /National Referred Journals</b></p> <ol style="list-style-type: none"> <li>1. Vasudeo, A.D., Katpatal, Y.B., Ingle, R.N., ( 2009) “Uses of Dielectric Constant Reflection Coefficients for determination of groundwater using Ground-Penetrating Radar” World Applied Sciences Journal, 6(10): 1321-1325, 2009.</li> </ol> <p><b>(b) Research Publications in Internal Conferences/National Conference</b></p> <ol style="list-style-type: none"> <li>1. Vasudeo, A. D., Katpatal, Y.B., Ingle, R.N., (2009) “Groundwater profile and level monitoring using Ground Penetrating Radar: Non-Invasive technique”. International Conference on Food Security and Environment Sustainability, IIT Kharagpur 17-19 Dec. 2009.</li> <li>2. A D Vasudeo, V S Landge and Y B Katpatal, (2011), “Hydrological Analysis for a Mining Block in Chhattisgarh State of India, World Academy of Science, Engineering and Technology, 1624-1627.</li> <li>3. Vasudeo, A.D., Katpatal Y.B., Ingle, R.N. (2009), “Variations In Radar Footprints And Refraction Coefficients With Depth Of Signal Penetration In Ground Penetrating Radar Survey For Locating Groundwater ” National Symposium, ISRS, Nagpur, Sept. 2009.</li> <li>4. B S Ruprai, A D Vasudeo and A G Tawalare, (2011), “Conventional Versus Optimum design process of Hydraulic Structure Design”, Hydro-2011, SVNIT, 877-881.</li> </ol>
<b>S R Dongre</b>	<p><b>(a) Research Publications in International /National Referred Journals</b></p> <ol style="list-style-type: none"> <li>1. Tembhurkar A. R. and Dongre Shilpa, “Comparative studies on fluoride removal using natural adsorbents, viz. Azadirachta Indica (Neem) and Ficus religiosa (Pipal)”, Journal of Institute of Engineers, Vol. 90, 18-23, 2009.</li> <li>2. Shilpa R. Dongre and Rajesh Gupta, “Optimal design of level-one redundant water distribution networks with fuzzy demands”, J. of Indian Water Works Association, 2012 (Accepted for publication).</li> </ol> <p><b>(b) Research Publications in Internal Conferences/National Conference</b></p> <ol style="list-style-type: none"> <li>1. Shilpa R. Dongre, Rajesh Gupta and P. R. Bhave, “Elitism between successive runs for improving performance of GA-based optimal design of water distribution networks”, International Conference on Sustainable Water Resources Management and Treatment Technologies on 19th-22nd January 2011 at NEERI, Nagpur.</li> <li>2. S. R. Dongre, Rajesh Gupta and P. R. Bhave, “Least-cost design of water distribution networks under uncertainty of nodal demands” International Conference on “Balance and Uncertainty-Water in a changing world” from</li> </ol>

	<p>June 26- July 1, 2011 at Brisbane, Australia.</p> <ol style="list-style-type: none"> <li>3. Shilpa R. Dongre and Rajesh Gupta, “Optimal design of water distribution networks under uncertain parameters”, International Conference on World Environmental and Water Resources Congress- 2013 scheduled from 19th-23rd May 2013 at Cincinnati, Ohio, USA.</li> <li>4. Rajesh Gupta, Shilpa Dongre and Aditya Tyagi, “Optimal design of level-one redundant networks with fuzzy demands”, International Conference on World Environmental and Water Resources Congress- 2013 scheduled from 19th-23rd May 2013 at Cincinnati, Ohio, USA.</li> <li>5. Shilpa R. Dongre, Dr. Rajesh Gupta and Dr. Pramod R. Bhave, “Uncertainty considerations in the design of water distribution networks”, 41st Annual Convention on Water Utility and Security Management, 8-10th January 2009, IWWA, Hyderabad.</li> <li>6. Shilpa R. Dongre, Dr. Rajesh Gupta and Dr. Pramod R. Bhave, “Optimal design of water distribution networks for uncertain demands”, National Conference on Sustainable Development of Urban Infrastructure, 18-19th June, 2010, V.N.I.T., Nagpur.</li> </ol>
<b>S.P Wanzari</b>	<p><b>(a) Research Publications in International /National Referred Journals</b></p> <ol style="list-style-type: none"> <li>5. Wanzari, S.P., Pophale, A D., Comparative Study of Bond Strength between Concrete and Reinforcement for various concrete grades of OPC and PCC by Pullout test, Frontiers of Structural and Civil Engineering” by Springer Link, DOI.1007/s11709-013-0193 published in Jan’2013</li> </ol> <p><b>(b) Research Publications in Internal Conferences/National Conference</b></p> <ol style="list-style-type: none"> <li>6. Wanzari, S.P., Pophale, A D. “The effect of variation of Steel fiber content in PPC Concrete on Bond stress between steel and Concrete without Transverse Reinforcement” in Proceedings of The First National Conference on “Recent Trends in Engineering &amp; Sciences” (NCRTEs-2012) PIES, INDORE, 20-21 APRIL 2012.</li> <li>7. Wanzari, S.P., Pophale, A D. Comparative Study of Bond Strength of Plain Bar and TMT bar for various grades of Concrete by Pullout Test, Structural Engineering Convention at SVNIT Surat on 19-21st Dec’12</li> <li>8. Wanzari, S.P., Pophale, A D. Comparative study of Bond Strength between Concrete and Reinforcement for various grades of OPC and PPC Concrete with various diameters of TMT bar. International Conference on Civil Engineering at Tirupati , 7-8 Sept 2013.</li> </ol>
<b>A G Tawalare</b>	<p><b>(b) Research Publications in Internal Conferences/National Conference</b></p> <ol style="list-style-type: none"> <li>1. Abhay Tawalare and Rajesh Lalwani (2012) “Resource leveling in Construction Projects using Re-Modified Minimum Moment Approach”, International Conference in Civil Engineering, Kaula Lumpur, Malaysia,33-35.</li> <li>2. B.S. Ruprai, A.D. Vasudeo and A.G. Tawalare (2011) “ Conventional versus optimum design process of Hydraulic Structure design”, Hydro 2011, SVNIT Surat, 877-881.</li> <li>3. Abhay Tawalare and Swapnil Wanjari(2010) “ Need of Introduction to Taxation Laws in Civil Engineering curriculum in India”, Sustainable Development of Urban Infrastructure, VNIT Nagpur, 296-302.</li> </ol>
<b>A. Patel</b>	<p><b>(a) Research Publications in International /National Referred Journals</b></p>

4. Patel, A. "Characterization of cavities in rocks using drilling parameters" International Journal of Rock Mechanics & Mining Sciences". Tentatively Accepted. 2013
5. Erzin Y., Patel, A., Singh, D. N., Tiga, M. G., Yilmaz, I., and Srinivas, K. "factors influencing the crushing strength of some Aegean sands." Bulletin of Engineering Geology and Environment Journal. doi:10.1007/s10064-012-0424-9. Volume 71, Issue 3, pp 529-536. 2012
6. Patel, A. "An assessment on shear wave velocity based criteria for liquefaction susceptibility of soils." Electronic Journal of Geotechnical Engineering, Vol.17/M, pp. 1959-1968. 2012
7. Patel, A. "Mountain erosion and mitigation-Global state of the art." Journal of Environmental Earth Science and Formerly Environmental Geology, Vol. 66, No. 6, pp.1631-1639. 2012
8. Patel, A. "Coastal Degradation-Problems, causes and remedial measures." International Journal of Environmental Engineering and Management. ISSN: 2231-1319. Vol. 3, No.1, pp. 1-7. 2012
9. Patel, A. "Necessity of piezo-ceramic elements for geotechnical field application." International Journal of Civil Engineering Research, ISSN: 2278-3652 ,Vol. 2, No.2, pp. 175-184.2012
10. Patel, A, Singh, D.N., and Singh, K. K. "Application of piezoceramic elements for determining elastic properties of soils." Geotechnical and Geological Engineering. 30, 407-417.2012
11. Patel, A., and Singh, D.N. "Application of piezo-ceramic elements for soil mass characterization. LAP LAMBERT Academic Publishing GmbH & Co., Saarbrücken Germany, ISBN No. 978-3-8433-77317. 2011
12. Patel, A., Kulkarni, M. P., Gumaste, S. D., Bartake, P. P., Rao, K. V. K. and Singh, D.N., "A Methodology for Determination of Resilient Modulus of Asphaltic Concrete", Advances in Civil Engineering, Special issue on Advances in Instrumentation and Monitoring in Geotechnical Engineering, Article ID 936395, 6 Pages, doi:10.1155/2011/936395, 2011
13. Patel, A., Singh, D.N., and Singh, K.K. "Performance analysis of piezo-ceramic elements for soil mass characterization." Geotechnical and Geological Engineering, Vol. 28, No.5, pp. 681-694, 2010
14. Kulkarni, M.P., Patel, A., and Singh, D.N. "Application of shear wave velocity for characterizing clays from coastal regions." KSCE Journal of Civil Engineering, Vol. 14, No.3, pp. 307-321, 2010
15. Erzin Y., Rao, B. H., Patel, A., Gumaste, S. D., and Singh, D. N. "Artificial neural network models for predicting electrical resistivity of soils from their thermal resistivity." International Journal of Thermal Sciences, No.49, pp. 118-130, 2010
16. Patel, A., Bartake, P.P., and Singh, D.N. "An empirical relationship for determining shear wave velocity in granular materials accounting for grain morphology." Geotechnical Testing Journal, ASTM, Vol. 32, No.1, pp. 1-10, 2009
17. Patel, A, and Singh, D.N. "A generalized relationship for estimating shear wave velocity in soils." International Journal of Geotechnical Engineering, Vol.3, No.3, pp. 343-351, 2009

**(b) Research Publications in Internal Conferences/National Conference**

1. Patel, A. "A Study on irrigation and groundwater Depletion," Proceedings of the 2nd International Conference in Advances in Mechanical, Manufacturing and Building Science, ICAMB 2012, 9-11 January 2012,
2. Patel, A. "Subsurface Characterization using Drilling Process Monitoring", International Symposium on Advances on Ground Technology and Geo-

informations, IS-AGTG, Dec 1-2, 2011, Singapore. Kok Kwang Phoon, Siang Huat Goh, Rui Fu Shen and Hehua Zhu Edition, Published by Research Publishing, Singapore ISBN: 978-981-07-0188-8 , 2011

**c. Faculty Contribution - R&D and Consultancy work with amount**

Name of the faculty	R&D and Consultancy work with amount
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**1. Dr. V.A. Mhaisalkar**

Title of the project	Funding agency	Duration	Coordinators	Current Status	Amount (in Lacs)
Maharashtra Pollution Control Board (MPCB), Mumbai	National Ambient Air Quality Monitoring Project (NAMP)	Long term (continuing since 1994)	Dr. V. A. Mhaisalkar	Ongoing	ˆ 8.1 lacs /yr.
Maharashtra Pollution Control Board (MPCB), Mumbai	State Ambient Air Quality Monitoring Project (SAMP)	Long term (continuing since July 2009)	Dr. V. A. Mhaisalkar	Ongoing	ˆ 8.1 lacs /yr.

Major Consultancy Projects	Provided to	Coordinators	Year	Amount (Rs. )
Performance Audit of six water treatment plants supplying drinking water to the city of Nagpur	Nagpur Municipal Corporation, Nagpur	V. A. Mhaisalkar	2009	ˆ 8.9 lacs

**2. Dr.P.D.Porey (Presently director of SVNIT, Surat and is not present since 2005 to till date)**

**3. Dr. A. D. Pofale**

**4. Dr. R. Gupta**

Title of the project	Funding agency	Duration	Coordinators	Current Status	Amount In Lacs
Performance evaluation of few Regional Rural Water Supply Schemes and Development of guidelines for their planning, design, operation and	Sponsored by MJP	2008-2011	Dr. Rajesh Gupta & Dr. Pramod R. Bhawe	Completed	6.75



management						
Water quality reliability based optimal design of water distribution networks		Sponsored by UGC	2008-2011	Dr. Rajesh Gupta & Dr. Pramod R. Bhawe	Completed	6.55
<b>S. N.</b>	<b>Major Consultancy Projects</b>	<b>Provided to</b>	<b>Coordinators</b>	<b>Year</b>	<b>Amount (Rs. )</b>	
1	Design of water distribution system for Kalmeshwar for 24x7 supply	M/s Puranik Brothers, Nagpur	Dr. R. Gupta	2009	35000/-	
2	Scrutiny of Technical report for upgradation of MIDC water supply	MIDC, Nagpur	Dr. R. Gupta	2009	28090/-	
3	Design of Sewerage system for Tuljapur City	MJP, Tuljapur	Dr. R. Gupta	2009	56135/-	
4	Location & Sizing of head-dissipating devices for control of flow	MJP, Jalgaon	Dr. R. Gupta	2009	30781/-	
5	Redesign of Gondia Underground Sewerage Scheme	MJP, Gondia	Dr. R. Gupta	2009	50120/-	
6	Design of Sewerage Sytem for Zone 4 and 5 of Amravati Zone	MJP, Amravati	Dr. R. Gupta	2009	39575/-	
7	Hydraulic Designs for Water Supply Project of Naya Raipur	M/s Puranik Brothers,	Dr. R. Gupta	2009	50000/-	
8	Checking and Approval of Hydraulic Design of Pumping Main for Raipur City	PHE, Project Division, Raipur (CG)	Dr. R. Gupta	2009	262600/ -	
9	Checking of Hydraulic designs of Water Distribution Network of Ballarpur Town	M/s Puranik Brothers,	Dr. R. Gupta	2009	20045/-	
10	Checking of Hydraulic designs of Water Distribution Network of Deoli Town	M/s Puranik Brothers, Nagpur	Dr. R. Gupta	2009	30060/-	
11	Scrutiny and Approval of hydraulic designs of pumping mains and distribution network of Dhamtari	PHED, Dhamtari, (C.G.)	Dr. R. Gupta	2010	168875/ -	
12	Measures to improve the Gondia water supply system	MJP, Nagpur	Dr. R. Gupta, Prof. A. Tawalare	2010	27060/-	
13	Approval to design of underground sewer network for GMC, Akola	MJP, Akola	Dr. R. Gupta	2010	14530/-	
14	Scrutiny of water supply and sewage services system design	Ramnath Developers Pvt. Ltd., Nagpur - 10	Dr. R. Gupta, Dr. Y. B. Katpatal, Prof. D. J. Katyayan, Prof. A. Tawalare	2010	44502/-	

15	Checking of hydraulic design of pipe line work at Panna (M.P.)	M/s. S. K. Constructi on, M.P.	Dr. R. Gupta, Dr. A. R. Tembhurkar	2010	15000/-
16	Finding out reasons for cracks in canal lining and suggesting some remedial measures	VIDC, Nagpur	Dr. Rajesh Gupta Prof. D. J. Katyayan Dr. Y. B. Katpatal and Prof. A. G. Tawlare	2010	254600/ -
17	Alternative to Replacement of PSC Line : Deoli Growth Centre	MIDC, Nagpur	Dr. Rajesh Gupta and Dr. A. D. Ghare	2011	56120/-
18	Planning of water supply to Priyadarshini College of Engineering Hingna Road, Nagpur	Permanent Agro Pvt. Ltd., Nagpur	Dr. Rajesh Gupta and Dr. A. D. Ghare	2011	44120/-
19	Improvement to Solapur Sewerage sewerage Systems	MJP, Solapur	Dr. Rajesh Gupta and Dr. A. D. Ghare	2011	70000//-
20	Design of Screens, Grit Chamber & Facultative Aerated Lagoon for Kampthee underground sullage	M/s Shradha Enterprises , Nasik	Dr. R. Gupta Dr. A. R. Tembhurkar A. G. Tawalare	2011	66180/-
21	Amravati Underground Drainage System	Superinten ding Engineer, MJP Amravati	Dr. R. Gupta Dr. A. R. Tembhurkar	2011	33090/-
22	Mathematical model analysis for spillway and energy dissipation arrangement	Executive Engineer, Wan Project Division Shegaon	Dr. Rajesh Gupta and Dr. A. D. Ghare	2011	104785 0/-
23	Design and Scrutiny for SEHORE Water Supply Project Under UIDSSMT Scheme.	Gondwana Engineers Ltd., Nagpur	Dr Rajesh Gupta	2011	1,98,54 0/-
24	Redesign of Main (True Line) Sewer Line Kampthee Underground Sullage Scheme.	Kampthee Municipal Council ,Kampthee.	Dr Rajesh Gupta	2011	44,120/-
25	Improvement to Solapur Sewage Scheme. (Redesign with Minimum Sewer Size of 200mm)	MJP, Works Division, Solapur	Dr Rajesh Gupta	2011	22,060 /-
26	Preparation of Design Note for Water Hammer Control (Anti Surge) for Kurha – Vadhoda Lift Irrigation	Design Divisional Unit,	Dr Rajesh Gupta	2011	2,45,41 8/-

	Scheme.	Mahabal Road, Jalgaon			
27	Turali Irrigation Project: Surge Analysis for Rising Main of Pal & Hindoli LIS.	Kanhar, Canal Division No. 2, Karawadi, Karad	Dr Rajesh Gupta	2011	2,31,630/-
28	Underground Drainage Scheme for Amravati M.C. Area: Approval for Design of Sewage Collection System of Badnera Zone No DDB 1 & DDB 2.	MJP, Works Division No II, Maltekadi Road, Amravati	Dr Rajesh Gupta	2011	44,120/-
29	Mathematical Model Study for Water Hammer Analysis of Sina Kolegaon Projects.	Sina Kolegaon Project Division, PARanda, Dist. Osmanabad	Dr Rajesh Gupta	2011	88,240/-
30	Surge Analysis for Rising Main of BrahmaGavhan Lift Irrigation Scheme in Taluka Paithan, Dist: Aurangabad. Part I & II	Minor Irrigation Division No. 1. Aurangabad.	Dr Rajesh Gupta	2011	Rs. 1,98,540/-
31	Surge Analysis of the Rising Main of Wakude Sage I & II Dist. Sangli	Mechanica I Division, Satara.	Dr Rajesh Gupta	2011	1,32,360/-
32	Design of Underground Sewage System for Gadchiroli	MJP Works Division No II, Jal Bhawan, Main Post Office, Main Road, Chadrapur	Dr Rajesh Gupta	2011	3,44,136/-
33	Surge Analysis for Rising Main of Mehakari Medium Project in Taluka Ashti Dist. Beed.	Medium Project Division, Sinchan Bhavan, Anand Nagar, Osmanabad.	Dr Rajesh Gupta	2011	99,270/-
34	Redesign of Gravity Main Network for Naya Raipur	JITF, Water Infra (Naya Raipur) Ltd.	Dr Rajesh Gupta	2011	66,180/-

35	Mathematical model Study for Water Hammer Analysis of Shirala LIS	Maharashtra Krishna Valley Development Corporation, Paranda	Dr Rajesh Gupta	2011	99270/-
36	UG Drainage Scheme for Amravati City Zone 1 to 3.	Executive Engineer, Maltekadi Road, Amravati.	Dr Rajesh Gupta	2012	68,386/-
37	Surge Analysis for Raising Main of Janai LIS	Chaskman Project Division Pune.	Dr Rajesh Gupta	2012	1,10,500/-
38	Surge Analysis for the Rising main of Venavadi Pump House Stage – I	Nira Deoghar Project Division, Pune	Dr Rajesh Gupta	2012	1,10,300/-
39	Execution of commissioner Work	Hon'ble Judge, Civil Line Nagpur	Dr Rajesh Gupta	2012	42884/-
40	Preparation of design note for Water Hammer Control System for Krishna Marathwada Lift Irrigation Scheme – I (Stage 1,2,3,&4)	Yash Engineers, Aurangabad	Dr Rajesh Gupta	2012	4,04,496/-
41	Preparation of design note for Water Hammer Control System for Krishna Marathwada Lift Irrigation Scheme – I (Stage 2, 3A, 3B &4)	Yash Engineers, Aurangabad	Dr Rajesh Gupta	2012	3,37,080/-
42	Dhapewada Lift Irrigation Scheme Stage – I Detailed Surge Analysis for the rising main of Khairbanda Feeder	Lift Irrigation Project Division, Tirora	Dr Rajesh Gupta	2012	1,32,360/-
43	Underground Drainage Scheme for Amravati City- Approval for Design of Sewage Collection System of zones 4&5	MJP Nagriwa Grami Yojna Vibhag, Daryapur	Dr. Rajesh Gupta	2012	187510/-
44	Design of Anti Surge Device for Zansinagar Lift Irrigation Scheme	Lift Irrigation Project Division, Tiirora Gondia	Dr. Rajesh Gupta	2012	91012/-
45	Design of Anti Surge Device for Tajnapur UPSA Lift Irrigation Shevgao, Ahmednagar	Tajnapur UPSA Lift Irrigation, Tah – Shevgao, Distt: Ahmednag	Dr Rajesh Gupta	2012	373035/-

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46	Proof Checking for Piped Water Supply Sceme in Bankura – I II & Borjora (Part – I )	NCC Ltd., Hyderabad	Dr. Rajesh Gupta	2012	168540/ -
47	Checking of design of group water supply scheme - SAJA both Transmission & Distribution System	PHED, Durg (C.G.)	Dr. Rajesh Gupta	2013	141184/ -

**5. Dr. Y.B. Katpatal.**

Title of the project	Funding agency	Duration	Coordinators	Current Status	Amount
Study on flow characteristics on Labyrinth weirs	MHR D	Three Years	Y B Katpatal A.D. Vasudeo P D Porey	Completed 2010	12 La cs

S. N.	Major Consultancy Projects	Provided to	Coordinators	Year	Amount (Rs. )
1.	Groundwater Assessment	Apex Pvt. Ltd, Nagpur	Y B Katpatal	2009	51000
2.	Runoff Modeling	Arun Tarar Consultants	Y B Katpatal A D Vasudeo	2010	1,44,000
3.	Runoff Modeling	PWD Chattisgarh	A D Vasudeo R Gupta	2010	6,00,000
4.	Investigations on canal lining	VIDC Nagpur	Y B Katpatal Dr. R Gupta D.J. Katyayan A.G. tawlare	2010	30,000
5.	Investigations on canal lining	VIDC Nagpur	Y B Katpatal Dr. R Gupta D.J. Katyayan A.G. Tawlare	2011	2,50000
6.	Vegetation change in Balco Plant	Bhupesh Baghel Chhattisgarh	Y B Katpatal	2011	93,000
7.	Drainage analysis in Jharkhand Coal blocks of NTPC	Medalion	Y B Katpatal A D vasudeo	2011	44,000
8.	Strata Classification for Railway Overbridge at Chandrapur and Rajura.	PWD, Chandrapur	Y B Katpatal	2011	62,000
9.	Lay outing of Gupta-Dupare layout	Hon. High Court	Y B Katpatal Dr. R Gupta S.P. Wanjari Dr. A.D. Vasudeo	2013	50,000

### 6. D. J. Katyayan

Title of the project	Funding agency	Duration	Coordinators	Current Status	Amount
Rural Road Pavement Performance Study	National Rural Road Development Agency, MO Rural Development, GOI, New Delhi	2007- 2010	Prof. D.J. Katyayan Prof. V. S. Landge	Report Submitted Accts. To be settled	Rs. 10 Lacs

S. N.	Major Consultancy Projects	Provided to	Coordinators	Year	Amount (Rs. )
1	Scrutiny of various Road & Bridge proposals for PMGSY	National Rural Road Development Agency, MO Rural Development, GOI, New Delhi	Prof. D. J. Katyayan, & Prof. V. S. Landge		
2	Reasons for cracks in lining of left Bank canal of Gosikhurd Project and Remedial Measures	Chief Engineer, Gosikhurd Project Water Resources Department, Nagpur	Prof. D. J. Katyayan & Prof. Rajesh Gupta	2010	2,54,600/

### 7. Dr.A.R.Tembhurkar

S. N.	Major Consultancy Projects	Provided to	Coordinators	Year	Amount (Rs. )
1	Design of Screens, Grit Chamber & Facultative Aerated Lagoon for Kampthee underground sullage	M/s Shradha Enterprises, Nasik	Dr. R. Gupta Dr. A. R. Tembhurkar A. G. Tawalare	2011	66180/-
2	Amravati Underground Drainage System	Superintending Engineer, MJP Amravati	Dr. R. Gupta Dr. A. R. Tembhurkar	2011	33090/-
3.	Checking of Hydraulic Design of Pipes work at Pauna MP	M/s S K Construction MP	Dr. R Gupta Dr A R tembhurkar	2010	15000/-

### 8. Dr. M.V.Latkar

### 9. Dr. V.S.Landge

Title of the project	Funding agency	Duration	Coordinator	Current Status	Amount
Rural Road Pavement	National Rural Road Development	2007- 2010	Prof. D.J. Katyayan	Report Submitted Accts. To be	Rs. 10 Lacs

Performance Study	Agency, MO Rural Development, GOI, New Delhi		Prof. V. S. Landge	settled	
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#### 10. Dr. A. D. Ghare

Title of the project	Funding agency	Duration	Coordinators	Current Status	Amount
Development of Water Resources and Flood Management Centre at SVNIT, Surat	AICTE-Nationally Coordinated Project (NCP) F No : 8024/RID/BO II/NCP(18)/2007-08	3 years	Prof. A. D. Ghare, Co-coordinator from VNIT	Completed in 2012	Rs. 40 Lakh (Approx)
Technical & Feasibility study of overburden rock of Dongri Buzurg & Kandri Mines for consolidated hydraulic stowing in underground mines	MOIL, India	3 years	Prof. A. D. Ghare, Co-coordinator from Civil Engg. Deptt. Prof. I. L. Muthreja and Prof. Rajendra Yerpude, from Mining Department	Ongoing since 2011	Rs. 39.25 lakh
Estimation of discharge through Trapezoidal Agricultural Canal using Simple Cylindrical Flume	KDK CoE, Nagpur	3 years	Prof. A. D. Ghare, Mentor coordinator from VNIT	Ongoing since 2010	Rs. 5.5 lakh
Experimental studies on Convergent Stepped Spillways	RGI, Nagpur	3 years	Prof. A. D. Ghare, Mentor coordinator from VNIT	Ongoing since 2011	Rs. 5 Lakh

#### 11. Dr.R.V. Ralegaonkar

Title of the project	Funding agency	Duration	Coordinators	Current Status	Amount
Design Development of decision support tool for sustainable construction	Department of Science & Technology, New Delhi (SR/ FTP/ ETA-067/2009)	2010-2014	Rahul V Ralegaonkar	On-going	15.5 Lakhs
Application of Industrial Waste in Making High Performance Bricks	Department of Science & Technology, New Delhi (SSD/TISN/020/2009)	2010-2012	Sachin A Mandavgane & Rahul V Ralegaonkar	Completed	22.01 Lakhs

Major Consultancy Projects	Provided to	Coordinator	Year	Amount (Rs. )
Preparation of Unified Schedule of Rates for the Works in Public Health Engineering Department, Chattisgarh	Public Health Engineering Department, Raipur, Chattisgarh	Rahul V Ralegaonkar/ V A Mhaisalkar	2011-12	2,00,000
To check the verticality of High Power Transmission Tower at Bilaspur	Prasar Bharti, All India Radio & Doordarshan, Mumbai	Rahul V Ralegaonkar/ V A Mhaisalkar	2012	66,180

### 12. Dr. A. Mandal

Title of the project	Funding agency	Duration	Coordinators	Current Status	Amount
Seismic Behaviour of Underground Structures	DST	3 yrs	A. Mandal	Revised proposal submitted	Rs. 53 lacks
Vibration Isolation Techniques for Foundation of Structure subjected to dynamic loading	CSIR	3 yrs	A. Mandal	Under Review	Rs. 27 lacks
Dynamic Behaviour of Underground Structures in Layered Media under Surface Excitation	BRNS	3 Yrs.	A. Mandal	Under Review	Rs 37 lacks

S. N.	Major Consultancy Projects	Provided to	Coordinators	Year	Amount (Rs. )
1.	Technical report on sand filling in excavated trench on pavement	Bilaspur Municipality	A Mandal	2012	Rs. 67,000/
2.	Determination of Bearing capacity and foundation type in black cotton soil	MSED Co.	A Patel	2013	Rs. 73,000/
3.	Determination of soil properties for state highway bridge.	Maharstra PWD	A. .Mandal	2013	Rs. 67,000/

### 11. Dr. D.H. Lataye

Title of the project	Funding agency	Duration	Coordinators	Current Status	Amount
Development of Low cost adsorbents for the removal of fluoride from drinking water.	DST	3 years	Dr. D.H. Lataye	Completion	15.60



### 13. A D Vasudeo

Title of the project	Funding agency	Duration	Coordinators	Current Status	Amount
Foaming Studies on the Toe of Stepped Spillway.	MHRD	2006-2009	Dr. Y B Katpatal Prof. A D Vasudeo	Completed	10 lacs
Study of Flow Characteristics of Labyrinth Weir.	MHRD	2007-2009	Dr. Y B Katpatal Prof. A D Vasudeo	Completed	12 lacs
Innovative Technologies to be used in construction of Rural Roads.	MRRDA & NRRDA		Dr V S Landge Dr A D Vasudeo Dr A Patel	On Going	1.0829 crores

S. N.	Major Consultancy Projects	Provided to	Coordinators	Year	Amount (Rs. )
1.	C Values of Central Spun Pipe	M/s Kapilansh Dhatu, Nagpur.	Prof. A D Vasudeo	2009	25,000/-
2.	C Values of Central Spun Pipe	M/s Kapilansh Dhatu, Nagpur.	Prof. A D Vasudeo	2010	25,000/-
3.	Remedial Measures for Stone Masonary Wall of Kendriya Vidyalaya, Pulgaon.	Kendriya Vidyalya Pulgoan	Dr. V S Landge. Prof. A D Vasudeo.	2010	25,000/-
4.	Checking of Design for NHAI	Executive Engineer, MIDC.	Dr. R Gupta Dr. A D Vasudeo Prof. A G Tawalare.	2010	15,000/-
5.	Approach way from NHAI to Sahara City Homes Nagpur	M/s Sahara Homes, Nagpur	Dr. V S Landge. Dr. A D Vasudeo.	2011	15,000/-
6.	Nalla Diversion Work for Coal Block at Raigad.	M/s Arun Tarrar Consulting, Nagpur	Dr. Y B Katpatal Prof. A D Vasudeo	2010	1,50,000/-
7.	Design of pump House at RUB at Raipur City	M/s RITES, India.	Dr. R Gupta Dr. Y B Katpatal Dr. A D Vasudeo	2011	6,00,000/-
8.	Nalla Diversion work at Hazipahad Mines	M/s Medallion Consulting.	Dr. Y B Katpatal Dr. A D Vasudeo	2011	50,000/-
9.	Surge Analysis for Rising Main at Chimur.	Executive Engineer, Chandrapur.	Dr. A D Vasudeo	2012	1,29,000/-
10.	Design of Slurry Pipeline for Power Plant at Chandrapur.	M/s. Mecgale Pneumatics, Nagpur.	Dr. V A Mhaisalkar Dr. A D Vasudeo	2012	3,50,000/-
11.	Surge Analysis of Palsgaon Ambdi Lift Irrigation Project.	Executive Engineer, Chandrapur.	Dr. A D Vasudeo	2013	1,29,000/-
12.	Surge Analysis of Borghat Lift Irrigation Project.	Executive Engineer, Chandrapur.	Dr. A D Vasudeo	2013	1,29,000/-

**14. Dr. S R Dongre**

Title of the project	Funding agency	Duration	Coordinators	Current Status	Amount
Nil					

**15. S.P Wanzari**

Title of the project	Funding agency	Duration	Coordinators	Current Status	Amount
Nil					

**16. A G Tawalare**

S. N.	Major Consultancy Projects	Provided to	Coordinator	Year	Amount (Rs.)
1.	Design of Retaining wall at Wenna River	CEO, Nagar Parishad Hinganghat	A G Tawalare	2013	24,000 /-
12	Scrutiny of Structural Design of 115 MLD WTP at Nagpur	Veolia Water Works, Nagpur	A G Tawalare	2012	3,30,900 /-
3	Scrutiny of Structural Design of various components of Durgapur WSS, West Bengal	SMS Paryvaran, New Delhi	A G Tawalare	2011	2,20,600 /-
4	Scrutiny of Structural Design of ESR, GSR and WTP at various locations in Madhya Pradesh	Gondwana Engineers, Nagpur	A G Tawalare	2010	1,05,000 /-

**17. Dr. A. Patel**

S.No	Project Titles	Funding Agency	Cost of Projects (Rs. In Lakhs)	Investigator(s)	Present status of the project
1	Modeling of permeability in multi-layered soil system using shear and compression wave velocities at different confining stress	Department of Science & Technology (DST), Govt of India	25.0 Lakhs (Approx.)	Dr. Anjan Patel	Proposal Approved under Fast Track Scheme for Young Scientists but money not yet received
2	Modeling of progressive weathering effects on rock slope stability	Council of Scientific and Industrial Research (CSIR)	30.0 Lakhs (Approx.)	Dr. Anjan Patel	Proposal submitted

Industry/Organization	Topic/Activity	Cost	Investigator(s)	Present
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		(Approx.)		status
Bilaspur Municipality Corporation	wet sand backfilling of trenches done for sewage pipe line layout in Bilaspur	50,000	Dr. A. Patel Dr. A. Mandal	Completed
Maharashtra State Electricity Transmission Co. Ltd	Soil Investigation for proposed 220kV substation, Uppaiwadi Dist, Nagpur	67,000	Dr. A. Patel Dr. A. Mandal	Completed
Road Project Division, Akola, Govt. Of Maharashtra	Soil testing and technical opinion for construction of major bridge across Man river on Shegaon-Devri-Akot SH Way-24, Akola	67,500	Dr. A. Patel Dr. A. Mandal	Ongoing

### 5.1. Student -Teacher Ratio (STR) (20)

STR is desired to be 15 or superior

Assessment =  $20 \times 15/STR$ ; subject to maximum assessment of 20

$STR = (x + y + z)/N1$

where, x = Number of students in 2nd year of the programme

y = Number of students in 3rd year of the programme

z = Number of students in 4th year of the programme

N1 = Total number of faculty members in the programme (by considering fractional load)

Year	x	y	z	x+y+z	N1	STR	Assessment (Max. is 20)
CAYm2	91	89	66	246	8.85	27.79	10.79
CAYm1	90	91	89	270	7.84	34.44	8.71
CAY	92	90	91	273	8.16	33.45	8.96
Average Assessment							9.48

For Item nos. 5. 2 to 5. 8, the denominator term (N) is computed as follows:

$N = \text{Maximum } \{N1, N2\}$

N1 = Total number of faculty members in the programme (considering the fractional load)

N2 = Number of faculty positions needed for student-teacher ratio of 15.

Year	N1	N2	N = Max (N1, N2)
CAYm2	8.85	16.4	16.4
CAYm1	7.84	18	18
CAY	8.16	18.2	18.2

### 5.2. Faculty Cadre Ratio (20)

Assessment =  $20 \times \text{CRI}$

where, CRI = Cadre ratio index

=  $2.25 \times (2x + y)/N$ ; subject to max. CRI = 1.0

where, x = Number of professors in the programme

y = Number of associate professors in the programme

Year	x	y	N	CRI	Assessment
CAYm2	5	6	16.4	1	20
CAYm1	5	7	18	1	20
CAY	5	7	18.2	1	20
Average Assessment					20

### 5.3. Faculty Qualifications (30)

Assessment	=	3* FQI
Where CRI	=	Faculty Qualification Index
	=	$(10x+6y+4z_0)/N^2$ Such that , $x+y+ z_0 \leq N^2$ ; and $z_0 \leq z$
Where x	=	Number of Faculty members with PhD
y	=	Number of Faculty members with ME/M.Tech
z	=	Number of Faculty members with BE/B.Tech

Year	x	y	n	FQI	Assessment
CAYm2	12	4	16.4	8.78	26.34
CAYm1	14	4	18	9.11	27.33
CAY	15	3	18.2	9.23	27.69
Average Assessment					27.12

### 5.4. Faculty Competencies correlation to Programme Specific Criteria (15)

(Provide evidence that program curriculum satisfies the applicable programme criteria specified by the appropriate American professional associations such as ASCE. You may list the programme specific criteria and the competencies (specialisation, research publication, course developments etc.,) of faculty to correlate the programme specific criteria and competencies)

Faculty	Specialization	Publication	Course developments
Dr. V A Mhaisalkar	Environmental Impact Assessment Water	1) V. A. Mhaisalkar, P. Gwala, S. Andey, P. Labhsetwar and C. Kshirsagar "Lab Scale study on Electro coagulation defluoridation process optimization along with aluminium leaching in the process and Comparison with Full Scale Plant	Hazardous Waste Managent

	Treatment Plant Design	Operation” Water Science & Technology, 63.12, 201.	
Dr. Rajesh Gupta	Water Distribution Network System Optimization	Gupta, R., Vyas, J., Bhawe, P.R., (2012). “Comparison of looped water distribution network designs for various like flow distribution models”, Ingenieria Hydraulica y ambiental, Vol. 33, No. 3, 33-43.	Water Distribution Systems
Dr. Y B Katpatal	Remote Sensing and Geographical Information System	<ol style="list-style-type: none"> <li>1. Katpatal, Y.B., and Rama Rao, B.V.S., (2011). “Urban spatial decision support system for municipal solid waste management of Nagpur urban area using high resolution satellite data and Geographic Information System”, Journal of Urban Planning and Development. Vol. 137, Issue 1, 65-76, March 2011, doi:10.1061/(ASCE)UP.</li> <li>2. Roy, S. and Katpatal, Y. (2011). ”Cyclical Hierarchical Modeling for Water Quality Model-Based DSS Module in an Urban River System.” J. Environ. Eng., 137(12), 1176–1184. doi: 10.1061/(ASCE)EE.1943-7870.0000441</li> <li>3. Saklecha P.P., Katpatal Y.B., Rathore S.S., Agarawal D.K. (2011), ‘Correlation of Mechanical Properties of weathered Basaltic Terrain for strength Characterization of foundation using ANN’, International Journal of Computer Applications (0975 – 8887) Volume 33– No.10, November 2011, pp 7-12.</li> <li>4. Katpatal Y.B., Mhaisalkar V A, Mane Rohit ( 2012) “Conformal Analysis of Spatial shift in High Resolution Satellite Data (HRSD)” Int Journ of GIS April 2012, Journal of Geographic Information System, 2012, 4, 168-175.</li> <li>5. Rajashree Vinod Bothale and Yashwant B. Katpatal ‘Response of rainfall and vegetation to ENSO events during 2001 – 2011 in Upper Wardha watershed, Maharashtra, India’ Journal of Hydrologic Engineering. Submitted December 13, 2012; accepted April 4, 2013; posted ahead of print April 5, 2013. doi:10.1061/(ASCE)HE.1943-5584.0000</li> </ol>	<ol style="list-style-type: none"> <li>1. RS and GIS</li> <li>2. Spatial Analyses for Resources Management</li> </ol>
Dr. A.D. Ghare	Hydraulics	1. A D Ghare, P D Porey, R N Ingle, S S Gokhale ( 2010) Block Ramp Design for Efficient Energy Dissipation Journal of Energy Engineering, ASCE, 136, No. 1, pp 1-5	Advanced Hydraulics
Dr. V.S. Landge	Transportation Engineering	<ol style="list-style-type: none"> <li>1. Vivek S. Hokam, Dr. V. S. Landge,”An Overview Of Pavement Management System For Industrial Area”, International Journal of Engineering Research and Applications (IJERA) ISSN: 2248 -9622 ,(2013)</li> <li>2. A.K.Sharma; V.S.Landge;, “Zero Inflated Negative Binomial For Modeling Heavy Vehicle Crash Rate On Indian Rural Highway”, International Journal of Science and Advanced Technology (ISSN 2221-8386) Volume 2 No 8 August 2012</li> </ol>	<ol style="list-style-type: none"> <li>1. Traffic Engineering</li> <li>2. Pavement Design</li> </ol>

Dr. R.V. Ralegaonkar	Green Technology	<ol style="list-style-type: none"> <li>1. Ralegaonkar R. V. (2011) <i>Spatial Indexing of Buildings for Disaster Management</i>, International Journal of Civil Engineering and Architecture, David Publishing, USA, July 2011, Volume 5, No. 7 (Serial No. 44), pp. 655-659</li> <li>2. S.P. Raut, R.V. Ralegaonkar and S.A. Mandavgane (2013) <i>Utilization of recycle paper mill residue and rice husk ash in production of light weight bricks</i> International Journal of Archives of Civil and Mechanical Engineering, Elsevier, Volume I 3, pp. 269-275.</li> <li>3. Gireedhari Patle, Vaidehi Dakwale &amp; Rahul Ralegaonkar (2011) <i>Design of Green Building: A Case Study for Composite Climate</i> International Journal of Engineering Research and Applications, Vol. 1, Issue 2, pp.388-395.</li> <li>4. Ralegaonkar R. V. &amp; Gupta R. (2011) <i>Evaluation of a New Static Sunshade for Composite Climate using Experimentation</i>, International Journal of Engineering Research and Applications, Vol. 1, Issue 2, pp.251-258.</li> </ol>	Energy Efficient Buildings
Dr. A.R. Tembhurkar	Waste Water Treatment	<ol style="list-style-type: none"> <li>1. Arti Prasad , Dr. A.R. Tembhurkar, “ Development of Software for Selection of Optimal Site for Wastewater Treatment Plant Using Concept of Dominance Matrix” Jour. IAEM Vol. 36(1) Feb. 2009, 21-26.</li> <li>2. Dr. A.R.Tembhurkar, Radhika Deshpande “ Powdered Activated Lemon Peels as Adsorbent for Removal of Cutting Oil from Wastewater” Jour. of Hazardous, Toxic and Radioactive Waste, American Society for Civil Engineers <b>ASCE</b>, Vol 16, No 4 Oct 2012</li> </ol>	Industrial Waste water Treatment
Dr. D.H. Lataye	Water Treatment	<ol style="list-style-type: none"> <li>1. Lataye D. H., Mishra, Indra M., Mall, Indra D. Removal of 4-Picoline from Aqueous Solution by Adsorption onto Bagasse Fly Ash and Rice Husk Ash: Equilibrium, Thermodynamic and Desorption Study. <b>ASCE: Journal of Environmental Engineering</b>, 137 [11] (2011) 1048-1057.</li> <li>2. Lataye D. H., Mishra, Indra M., Mall, Indra D. Multicomponent Sorption of Pyridine and its Derivatives from Aqueous Solution onto Rice Husk Ash and Granular Activated Carbon. <b>ASCE: Practice Periodical of Hazardous, Toxic, and Radioactive Waste Management</b>, 18(4) (2009) 218-228.</li> <li>3. Singh Kalpana, Lataye Dilip H., Wasewar Kailas, Chang Kyoo Yoo. Removal of fluoride from aqueous solution: status and techniques. <i>Desalination and Water Treatment</i>. 51, (2013) 3233-3247. DOI: 10.1080/19443994.2012.749036.</li> </ol>	Hazardous Waste Management

Dr. Anirban Mondal	Geotechnical Engineering	<ol style="list-style-type: none"> <li>1. Mandal, A., Baidya, D.K., D. Roy, (2010) "Experimental Evaluation of Vertical Response of Rigid Surface Footing on Layered Soil." Int. Journal of Geotechnical Engineering, volume 4, issue 1.</li> <li>2. Mandal, A. C. P. Chakravarthy, R. Rath, A. Nanda and A. Usmani (2011), "Analysis and Design Approach of Large Storage Caverns", (In Press), Int. Journal of Geomechanics, ASCE. doi:10.1061/(ASCE)GM.1943-5622.0000180</li> <li>3. A.Usmani, A., Nanda, S.K.Jain and A. Mandal (2011), "Analysis and Design of an Underground Portal in Lateritic Soils" Journal of Geotechnical and Geological Engineering (Springer), DOI 10.1007/s10706-012-9494-5.</li> </ol>	Geotechnical aspects for design of machine Foundation
Dr. A.D Vasudeo	Water Resources	Vasudeo, A.D., Katpatal, Y.B., Ingle, R.N., ( 2009) "Uses of Dielectric Constant Reflection Coefficients for determination of groundwater using Ground-Penetrating Radar" World Applied Sciences Journal, 6(10): 1321-1325, 2009.	Hydrology
Dr. A. Patel	Geotechnical Engineering	<ol style="list-style-type: none"> <li>1. Patel, A. "Characterization of cavities in rocks using drilling parameters" International Journal of Rock Mechanics &amp; Mining Sciences". Tentatively Accepted. 2013</li> <li>2. Erzin Y., Patel, A., Singh, D. N., Tiga, M. G., Yilmaz, I., and Srinivas, K. "factors influencing the crushing strength of some Aegean sands." Bulletin of Engineering Geology and Environment Journal. doi:10.1007/s10064-012-0424-9. Volume 71, Issue 3, pp 529-536. 2012</li> <li>3. Patel, A. "An assessment on shear wave velocity based criteria for liquefaction susceptibility of soils." Electronic Journal of Geotechnical Engineering, Vol.17/M, pp. 1959-1968. 2012</li> <li>4. Patel, A. "Mountain erosion and mitigation-Global state of the art." Journal of Environmental Earth Science and Formerly Environmental Geology, Vol. 66, No. 6, pp.1631-1639. 2012</li> </ol>	Geotechnical investigations of construction projects

**5.5. Faculty as participants/resource persons in faculty development/training activities (15)**

(Instruction: A faculty member scores maximum five points for a participation/resource person.)

**Participant/resource person in two week faculty development programme : 5 points**

**Participant/resource person in one week faculty development programme : 3 Points**

Name of faculty	(Max. 5 per faculty)		
	CAYm2	CAYm1	CAY
V.A.Mhaisalkar	5	5	5
A. D. Pofale	3	3	3
Rajesh Gupta	5	5	5
Y. B. Kapatal	5	5	5
D.J.Katyanan	3	3	3
A.R.Tembhurkar	5	5	5
Dr. M.V.Latkar	3	3	3
V.S.Landge	3	3	3
A.D. Ghare	3	3	3
R V Ralegaonkar	3	3	3
A Mondal	0	0	3
D H Lataye	3	3	3
A D Vasudeo	3	3	3
S R Dongre	3	3	3
S.P Wanzari	0	3	3
A G Tawalare	0	0	3
A. Patel	0	0	3
Sum	47	50	59
N(Number of faculty positions required for an STR)	16.4	18	18.2
Assessment = $3 \times \text{Sum}/N$	8.59	8.33	9.72
Average assessment			8.88

**5.6. Faculty Retention (15)**

Assessment =  $3 \times \text{RPI}/N$

where RPI = Retention point index

= Points assigned to all  
faculty members

where points assigned to a faculty member = 1 point for each year of experience at the institute but not exceeding 5.

Item	CAYm2	CAYm1	CAY
Number of faculty with experience of less than 1 year ( $X_0$ )	0	2	0
Number of faculty with 1 to 2 years experience	0	0	2
Number of faculty with 2 to 3 years experience	3	0	0
Number of faculty with 3 to 4 years experience	0	3	0
Number of faculty with 4 to 5 years experience	2	0	3
Number of faculty with more than 5 years experience ( $X_5$ )	11	15	13



N	16	18	18
$RPI = X_1 + 2X_2 + 3X_3 + 4X_4 + 5X_5$	69	84	79
Assessment	12.94	14	13.16
Average assessment			13.36

### 5.7. Faculty Research Publications (FRP) (20)

Assessment of FRP =  $4 \times (\text{Sum of the research publication points scored by each faculty member})/N$

(Instruction: A faculty member scores maximum five research publication points depending upon the quality of the research papers and books published in the past three years.)

The research papers considered are those (i) which can be located on Internet and/or are included in hard-copy volumes/proceedings, published by reputed publishers, and (ii) the faculty member's affiliation, in the published papers/books, is of the current institution. Include a list of all such publications and IPRs along with details of DOI, publisher, month/year, etc.

Name of faculty (contributing to FRP)	FRP points (Max. 5 per faculty)		
	CAYm2	CAYm1	CAY
V.A.Mhaisalkar	1	1	4
A. D. Pofale	4	4	4
Rajesh Gupta	1	4	8
Y. B. Kapatal	5	22	5
D.J.Katyanan	0	0	0
A.R.Tembhurkar	2	3	8
Dr. M.V.Latkar	1	1	0
V.S.Landge	3	0	0
A.D. Ghare	0	4	1
R V Ralegaonkar	17	6	4
4A Mondal	0	2	3
D H Lataye	5	4	3
A D Vasudeo	0	2	0
S R Dongre	2	1	2
S.P Wanzari	2	2	1
A G Tawalare	1	2	0
A. Patel	1	7	5
Sum	45	65	48
N(Number of faculty positions required for an STR of 15)	16.4	18	18.2
Assessment FRP = $4x \text{ Sum}/N$	10.97	14.44	10.55
Average assessment			11.98

### 5.8. Faculty Intellectual Property Rights (FIPR) (10)

Assessment of FIPR =  $2 \times (\text{Sum of the FIPR points scored by each faculty member})/N$   
 (Instruction: A faculty member scores maximum five FIPR points each year??. FIPR includes awarded national/international patents, design, and copyrights.)

Name of faculty (contributing to FIRP)	FRP points (Max. 5 per faculty)		
	CAYm2	CAYm1	CAY
V.A.Mhaisalkar *	0	5	0
Y. B. Kapatal *	5	5	5
R V Ralegaonkar *	0	5	0
Sum	5	15	5
N	15	17	17
Assessment FIPR = 2x Sum/N	0.67	1.76	0.58
Average assessment			1.00

\* Patents have been filed and published, the award is awaited.

### 5.9. Funded R&D Projects and Consultancy (FRDC) Work (20)

Assessment of R&D and consultancy projects =  $4 \times (\text{Sum of FRDC by each faculty member})/N$

(Instruction: A faculty member scores maximum 5 points, depending upon the amount.) A suggested scheme is given below for a minimum amount of Rs. 1 lakh:

Five points for funding by national agency,

Four points for funding by state agency,

Four points for funding by private sector, and

Two points for funding by the sponsoring trust/society.

Name of faculty (contributing to FRDC)	FRDC points (Max. 5 per faculty)		
	CAYm2	CAYm1	CAY
V.A.Mhaisalkar	5	5	5
A. D. Pofale	4	4	4
Rajesh Gupta	5	5	5
Y. B. Kapatal	5	4	4
D.J.Katyanan	5	5	5
A.R.Tembhurkar	4	4	0
Dr. M.V.Latkar	0	0	0
V.S.Landge	5	5	5
A.D. Ghare	5	5	0
R V Ralegaonkar	5	5	5
A Mondal	0	4	4
D H Lataye	5	5	0
A D Vasudeo	4	4	5
S R Dongre	0	0	0
S.P Wanzari	0	0	0
A G Tawalare	4	4	4
A. Patel	0	5	5
Sum	56	64	51
N	15	17	17
Assessment FPPC = 4x Sum/N	14.93	15.05	12.00
Average assessment			13.99

### 5.10. Faculty Interaction with Outside World (10)

FIP = Faculty interaction points

Assessment =  $2 \times (\text{Sum of FIP by each faculty member})/N$

(Instruction: A faculty member gets maximum five interaction points, depending upon the type of institution or R&D laboratory or industry, as follows)

Five points for interaction with a reputed institution abroad, institution of eminence in India, or national research laboratories,

Three points for interaction with institution/industry (not covered earlier).

Points to be awarded, for those activities, which result in joint efforts in publication of books/research paper, pursuing externally funded R&D / consultancy projects and/or development of semester-long course / teaching modules.

Name of faculty (contributing to FIP)	FIP points		
	CAYm2	CAYm1	CAY
V.A.Mhaisalkar	5	5	5
A. D. Pofale	3	3	3
Rajesh Gupta	5	5	5
Y. B. Kapatal	5	5	5
D.J.Katyanan	5	5	5
A.R.Tembhurkar	5	5	5
V.S.Landge	3	3	5
A.D. Ghare	5	5	5
R V Ralegaonkar	5	5	5
A Mondal	0	3	3
D H Lataye	5	5	0
A D Vasudeo	3	3	5
S R Dongre	3	3	0
S.P Wanzari	0	3	3
A G Tawalare	3	3	3
A. Patel	0	5	5
Sum	55	66	62
N	15	17	17
Assessment FIP = $2x \text{ Sum}/N$	7.33	7.76	7.29
Average assessment			7.46

## B6 Facilities and Technical Support

### 6. Facilities and Technical Support (75)

Description of classrooms, faculty rooms, seminar, and conference halls: (Entries in the following table are sampler entries)

#### 6.1. Classrooms in the Department (20)

##### 6.1.1. Adequate number of rooms for lectures (core/electives), seminars, tutorials, etc., for the program (10)

(Instruction: Assessment based on the information provided in the preceding table.)

Room Description	Usage	Shared/Exclusive	Capacity	Rooms Equipped with PC, Internet, Book rack, meeting space...
No. of Class Rooms	Class room for 2 <sup>nd</sup> Year	1/1	120	Projector
	Class room for 3 <sup>rd</sup> Year	1/1	100	Projector & AV system
	Class room for 4 <sup>th</sup> Year	1/1	100	Projector & AV system
Tutorial Rooms		3	50	
No. of Seminar Rooms		1	80	Projector & AV system
No. of Meeting Rooms		1	20	Projector & AV system
No. of Faculty Rooms		18		PC, Internet, Book Rack

##### 6.1.2. Teaching aids multimedia projectors, etc. (5)

(Instruction: List the various teaching aids available)

Class Room No.	Facilities
C1/1	Black Board, Projector
C1/2	Black Board, Projector & AV System
C1/3	Black Board
C1/4	Black Board, Projector & AV System
WRE/101	Black Board, Projector
WRE/102	Black Board
WRE/103	Black Board

##### 6.1.3. Acoustics, classroom size, conditions of chairs/benches, air circulation, lighting, exits, ambience, and such other amenities/facilities (5)

(Instruction: Assessment based on the information provided in the preceding table and the inspection thereof.)

Class No.	Room	Acoustics	Classroom size	Conditions of chairs/benches	Lighting & Ambience
C1/1		Good	78.75 Sqm	New	Adequate
C1/2		Good	118.65 Sqm	New	Adequate
C1/3		Good	42.00 Sqm	Old	Adequate
C1/4		Good	142.80 Sqm	Old	Adequate
WRE/101		Good	157.00 Sqm	New	Adequate
WRE/102		Good	54.95 Sqm	New	Adequate
WRE/103		Good	157.00 Sqm	New	Adequate

## 6.2. Faculty Rooms in the Department (15)

### 6.2.1. Availability of individual faculty rooms (5)

(Instruction: Assessment based on the information provided in the preceding table.)

Sr. No.	Faculty Room	Shared/ Exclusive	Area (sq.m.)	Rooms Equipped with PC, Internet, Book rack, meeting space
1.	V.A.Mhaisalkar	Exclusive	26.18	PC & Internet
2.	A. D. Pofale	Exclusive	15.00	PC & Internet
3.	Rajesh Gupta	Exclusive	13.50	PC & Internet
4.	Y. B. Kapatal	Exclusive	16.56	PC & Internet
5.	D.J.Katyanan	Exclusive	14.00	PC & Internet
6.	A.R.Tembhurkar	Exclusive	18.00	PC & Internet
7.	V.S.Landge	Exclusive	16.00	PC & Internet
8.	A.D. Ghare	Exclusive	18.055	PC & Internet
9.	R V Ralegaonkar	Exclusive	15.00	PC & Internet
10.	A Mondal	Exclusive	23.10	PC & Internet
11.	D H Lataye	Exclusive	18.00	PC & Internet
12.	A D Vasudeo	Exclusive	17.94	PC & Internet
13.	S R Dongre	Exclusive	18.00	PC & Internet
14.	S.P Wanzari	Exclusive	15.00	PC & Internet
15.	A G Tawalare	Exclusive	16.00	PC & Internet
16.	A. Patel	Exclusive	23.10	PC & Internet

### 6.2.2. Room equipped with white/black board, computer, Internet, and such other amenities/facilities (5)

(Instruction: Assessment based on the information provided in the preceding table)

### 6.2.3. Usage of room for counselling/discussion with students (5)

(Instruction: Assessment based on the information provided in the preceding table and the inspection thereof.)

All the faculty rooms and class rooms are used for Tutorials and Counseling of the students as all the faculty members are Faculty Advisors of the students and frequently interact with the students.

The following table is required for the subsequent criteria.

### 6.3. Laboratories in the Department to meet the Curriculum Requirements and the POs (25)

#### 6.3.1. Adequate, well-equipped laboratories to meet the curriculum requirements and the POs (10)

(Instruction: Assessment based on the information provided in the preceding table.)

<b>Lab Description in the Curriculum</b>	<b>Exclusive use/ Shared</b>	<b>Space, Number of</b>	<b>Number of Experiments Students</b>	<b>Quality of Instruments</b>	<b>Lab Manuals</b>
Transportation Engineering Lab	Exclusive	118.65 sqm	25 Students Capacity	Instruments are in working condition	Yes
Geotechnical Laboratory	Exclusive	118.65 sqm	25 Students Capacity	Instruments are in working condition	Yes
Concrete Technology	Exclusive	118.65 sqm	25 Students Capacity	Instruments are in working condition	Yes
Building Materials and Technology lab-	Exclusive	90.27 sqm	25 Students Capacity	Instruments are in working condition	Yes
Engineering Geology Lab	Exclusive	65.10 sqm	25 Students Capacity	Instruments are in working condition	Yes
Survey Lab	Exclusive	118.65 sqm	25 Students Capacity	Instruments are in working condition	Yes
Hydraulic Lab	Exclusive	175.00 sqm	25 Students Capacity	Instruments are in working condition	Yes
Environmental Chemistry Lab	Exclusive	108.85 sqm	25 Students Capacity	Instruments are in working condition	Yes
Environmental Microbiology Lab	Exclusive	108.85 sqm	25 Students Capacity	Instruments are in working condition	Yes
Water & Waste Water Lab	Exclusive	48.30 sqm	25 Students Capacity	Instruments are in working	Yes

(PHE UG)				condition	
Air Pollution Control & Monitoring	Exclusive	78.32 sqm	25 Students Capacity	Instruments are in working condition	Yes
Water Resources Engineering Laboratory	Exclusive	328 sqm	25 Students Capacity	Instruments are in working condition	Yes
Computer Lab UG & PG	Exclusive	77.87 sqm	40 Students Capacity	Instruments are in working condition	
Computer Lab (WRE)	Exclusive	17.25 sqm	10 Students Capacity	Instruments are in working condition	
Remote Sensing and GIS	Exclusive	31.74 sqm	14 Students Capacity	Instruments are in working condition	Yes

**Availability of computing facilities in the department (5)**

(Instruction: Assessment based on the information provided in the preceding table.)

Lab Description in the Curriculum	Space, Number of	Number of Experiments Students	Quality of Instruments
Computer Lab UG & PG	77.87 sqm	40 Students Capacity	Instruments are in working condition
Computer Lab (WRE)	17.25 sqm	10 Students Capacity	Instruments are in working condition

**6.3.3. Availability of laboratories with technical support within and beyond working hours (5)**

Laboratories are beyond regular hours for experimentations specially for project based work and testing and consultancy assignments.

Laboratories are available to any student for his project work or lab exercise as per his requirement with permission of lab In charge.

(Instruction: Assessment based on the information provided in the preceding table.)

**6.3.4. Equipment to run experiments and their maintenance, number of students per experimental setup, size of the laboratories, overall ambience, etc. (5)**

(Instruction: Assessment based on the information provided in the preceding table.)

Every laboratory can accommodate 25 students which is the batch size of the practicals. The lab facilities including the instruments and experimental set up is generally sufficient for this batch size. However, with increase in the student intake in the recent years it is realised that the bigger lab sizes are required for lab exercises.

#### 6.4. Technical Manpower Support in the Department (15)

##### 6.4.1. Availability of adequate and qualified technical supporting staff for programme-specific laboratories (10)

(Instruction: Assessment based on the information provided in the preceding table.)

##### 6.4.2. Incentives, skill, upgrade, and professional advancement (5)

(Instruction: Assessment based on the information provided in the preceding table.)

Name of the Technical Staff	Designation (Pay-Scale)	Exclusive/ Shared Work	Date of Joining	Qualification		Other Technical skills gained	Responsibility
				At joining	Now		
Mr.S.P.Sahasrabudhe	Tech SG-II		14/10/1993	Diploma in Civil Engineering	Nil	Training Done at IIT Mumbai & IIT Kanpur	1) To maintain the equipments of the labs , 2) To maintain the purchase & allied records of the department 3) To maintain records of testing and consultancy work to assist teachers in practicals, 4) to assist teaching in testing and consultancy work
Mr. R. N. Dhabarde	Sr. Lab Assist		07/04/1992	10 <sup>th</sup> Pass	Nil	ITI	All work related to laboratory



Ms. Rajani K. Kale	Jr. Assistant 2000/-		19/05/2008	BSC	Pursing MA	MSCIT	
Shri. P.B. Shende	Lab Attd		14/01/1994	SSC fail		Electric wireman , general fitter training, NDT Test Training	Lab work & works assigned by lab incharge and HOD
Shri. C.R. Bhakre	Lab Attd		15/09/1987	SSC fail		Nil	Lab work & works assigned by lab incharge and HOD
Shri. Kishore Chimote	Lab Attd		15.07.1960	SSC fail		Skills in Env Engg and Microbiology lab	Lab work & works assigned by lab incharge and HOD

## 7. Academic Support Units and Teaching-Learning Process (75)

Students' Admission

Admission intake (for information only)

Item	CAY 2012- 13	CAYm1 2011-12	CAY m2 2010 -11	CAYm3 2009- 2010
Sanctioned Intake Strength in the Institute (N)	738	738	738	652
Number of students admitted on merit basis (N1)	713	724	713	617
Number of students admitted on management quota / otherwise (N2)	48	14	45	54
Total number of admitted students in the Institute (N1+N2)	761	738	758	671

(Instruction: The intake of the students during the last three years against the sanctioned capacity may be reported here.)

Admission quality (for information only)

Divide the total admitted ranks (or percentage marks) into five or a few more meaningful ranges

Sr. No.	Rank range (AIEEE Ranking)	2012-13	2011-12	2010-11	2009-10
01	1-20000	410	436	411	367
02	20000-40000	136	137	130	105
03	40000-60000	49	30	47	29
04	60000-80000	48	38	38	36
05	80000-100000	27	37	29	22
06	100000-150000	21	19	26	25
07	150000-200000	8	12	10	14
08	200000-300000	9	6	4	11
09	300000-400000	1	3	4	1
10	400000-500000	1	2	3	0
11	500000-600000	2	1	2	0
12	600000-700000	1	1	0	0
13	Admitted without AIEEE ranks (foreign nationals)	48	15	45	53
	<b>Total</b>	<b>761</b>	<b>737</b>	<b>749</b>	<b>663</b>

(Instruction: The admission quality of the students in terms of their ranks in the entrance examination may be presented here.)

Tabular data for estimating student-teacher ratio and faculty qualification for first year common courses

List of faculty members teaching first year courses

Sr. No	Name of the faculty	Qualification	Designation	Date of joining the institution	Department with which associated	Distribution of teaching load (%)		
						1 <sup>st</sup> year	UG	PG
1.	Dr. S.S. Umare	Ph.D/M.Sc./M.Phil	Professor	23/8/96	Chemistry	--	30	70
2.	Dr. J.D. Ekhe	Ph.D/M.Sc./M.Phil	Associate Professor	24/7/96	Chemistry	--	53.3	46
3.	Dr. (Mrs.) Anupama Kumar	Ph.D/M.Sc./M.Phil	Associate Professor	7/1/2000	Chemistry	--	50	50
4.	Dr. Sujit Kumar Ghosh	Ph.D/M.Sc.	Associate Professor	4/7/12	Chemistry	21	--	79
5.	Dr. (Mrs.) Ramani V. Motghare	Ph.D/M.Sc.	Assistant Professor	17/05/06	Chemistry	18	82	--
6.	Dr. Chayan Das	Ph.D/M.Sc./Net	Assistant Professor	30/05/06	Chemistry	28	10	62
7.	Prof. Atul V. Wankhede	M.Sc./Net	Assistant Professor	26/05/09	Chemistry	88	--	12
8.	Dr. Sangesh P. Zodape	Ph.D/M.Sc.	Assistant Professor	02/04/12	Chemistry	--	--	100
9.	Dr. Umesh Rohidas Pratap	Ph.D/M.Sc.	Assistant Professor	25/5/12	Chemistry	88	--	12
10	Dr. (Mrs.) Sonali Umre	Ph.D/M.Sc.	Assistant Professor		Chemistry	91.67	--	8.33
11	Shri Parag Panse	M.Tech.	Assistant Professor		Chemistry	89.66	--	10.34
12	Dr. V.K. Deshpande	Ph.D/M.Sc.	Professor & Head	03/08/88	Applied Physics	68.6	15.7	15.7
13	Dr. R.S. Gedam	Ph.D/M.Sc.	Associate Professor	28/08/98	Applied Physics	40	30	30
14	Dr. B.R. Snpal	Ph.D/M.Sc.	Associate Professor	10/05/12	Applied Physics	37	--	63
15	Dr. G. Hemachandra	Ph.D/M.Sc.	Associate Professor	22/05/12	Applied Physics	84	--	16
16	Dr. (Mrs.) S.R. Patrikar	Ph.D/M.Sc.	Assistant Professor	16/05/06	Applied Physics	74	--	26
17	Dr. (Mrs) A. V. Deshpande	Ph.D.	Assistant Professor	16/05/06	Applied Physics	52	12	36
18	Dr. (Mrs.) S.M. Giripunje	Ph.D/M.Sc.	Assistant Professor	07/10/08	Applied Physics	53	--	47
19	Dr. K. Mohan Kant	Ph.D/M.Sc./M.Tech	Assistant Professor	14/06/12	Applied Physics	71.5	--	28.5
20	Dr. G.P. Singh	Ph.D.	Professor	27/03/95	Mathematics	15	35	50

21	Dr. P. Pramod Chakravarthy	Ph.d.	Associate Professor	31/05/06	Mathematics	25	25	50
22	Dr. M. Devakar	Ph.D.	Assistant Professor	24/11/08	Mathematics	25	25	50
23	Dr. Pallavi Mahale	Ph.D.	Assistant Professor	27/11/08	Mathematics	--	50	50
24.	Dr. G. Naga Raju	Ph.D.	Assistant Professor	1/7/10	Mathematics	25	25	50
25.	Dr. R. P. Pant	Ph.D.	Assistant Professor	25/6/12	Mathematics	25	25	50
26	Dr. Pradip Roul	Ph.D.	Assistant Professor	13/8/12	Mathematics	25	25	50
27	Dr. Malabika Adak	Ph.D.	Teaching Assistants	16/7/13	Mathematics	40	20	40
28	Mrs. Shweta Jain	M.Phil	Teaching Assistants	17/7/13	Mathematics	40	20	40
29	Mr. Mohd. Ahmed	M.Sc.	Teaching Assistants	18/7/13	Mathematics	50	50	--
30	Mr. Pravin Sayre	M.Sc.(Net Qualified)	Teaching Assistants	16/7/13	Mathematics	75	25	--
31	Mr. Samala Ratan	M.Sc.	Teaching Assistants	22/7/13	Mathematics	100	--	--
32	Mr. S. R. Bhide	Ph.D.	Associate Professor	12/7/84	Electrical Engg.	12	56	32
33	Mr. Prasad Venikar	(Research Scholar )		09/07/12	Electrical Engg.	46.15	53.84	--
34	Mr. S. S. Bhatt	Ph.D.	Associate Professor	01/04/87	Electrical Engg.	33.33	48.15	18.51
35	Mr. M. Irfan	(Research Scholar)		01/07/11	Electrical Engg.	21.43	78.57	--
36	Mr. V. B. Borghate	Ph.D.	Associate Professor	01/08/85	Electrical Engg.	25.93	55.56	18.52
37	B. S. Umre	Ph.D.	Associate Professor	02/07/84	Electrical Engg.	14.82	74.7	11.11
38	M. A. Choudhary	Ph.D.	Associate Professor	17/07/08	Electrical Engg.	14.82	55.56	29.63
39	P. S. Kulkarni	Ph.D.	Associate Professor	16/03/95	Electrical Engg.	32.14	53.57	10.71
40	M. R. Ramteke	Ph.D.	Associate Professor	05/03/95	Electrical Engg.	33.33	55.56	11.11
41	A. S. Junghare	Ph.D.	Associate Professor	07/03/95	Electrical Engg.	16.00	84.00	--
42	S. R. Tambay	Ph.D.	Associate Professor	03/08/81	Electrical Engg.	7.41	2.96	29.62
43	V. S. Kale	Ph.D.	Associate Professor	01/12/99	Electrical Engg.	14.82	62.96	22.22
44	N. R. Patne	Ph.D.	Lecturer	18/05/06	Electrical Engg.	31.03	68.96	--
45	H. M. Suryawanshi	Ph.D.	Professor	11/07/89	Electrical	11.11	33.33	55.55

					Engg.			
46	M. V. Aware	Ph.D.		17/12/90	Electrical Engg.	00.00	72.22	27.78
47	S. Patnaik	Ph.D.	Associate Professor	01/06/12	Electrical Engg.	25.93	62.96	11.11
48	R. J. Satputaley	M.Tech.		18/07/08	Electrical Engg.	31.03	58.62	10.34
49	A. Dhabaley	M.Tech.		16/05/05	Electrical Engg.	27.59	44.83	27.59
50	M. S. Ballal	Ph.D.	Associate Professor	04/04/12	Electrical Engg.	14.82	85.19	--
51	Sathyan	Ph.D.		09/07/12	Electrical Engg.	46.15	53.84	--
52	D. Khare	Ph.D.		01/01/13	Electrical Engg.	61.54	38.46	--
53	Amarendra	Ph.D.		01/07/13	Electrical Engg.	76.92	23.08	--
54	M. Thakre	Ph.D.		03/01/12	Electrical Engg.	61.54	38.46	--
55	M. Pandey	Ph.D.			Electrical Engg.	66.62	33.33	--
56	Rambabu	M.Tech.		16/07/13	Electrical Engg.	64.5	35.5	--
57	Ashok Kumar	M.Tech.		16/07/13	Electrical Engg.	64.5	35.5	--
58	Chandra Sekhar	M.Tech.		16/07/13	Electrical Engg.	00	100	--
59	Dr. S. V. Bopshetty	Ph.D.	Associate Professor	18/07/80	Mech. Engg.	30	30	30
60	Dr. A. B. Andhare	Ph.D.	Associate Professor	31/07/08	Mech. Engg.	0	0	30
61	Mr. M. S. Kotambkar	M.Tech.	Assistant Professor	27/7/06	Mech.Engg.	55	55	55
62	Mr. A. A. Thakre	M.Tech.	Assistant Professor	03/08/06	Mech. Engg.	50	50	50
63	Mr. P. V. Kane	M.Tech.	Assistant Professor	02/12/08	Mech.Engg.	45	45	45
64	Dr. L. M. Gupta	Ph.D.	Professor	18/10/89	Applied Mechanics	11	47	42
65	Dr. M. M. Mahajan	Ph.D.	Professor	17/08/92	Applied Mechanics	0	65	35
66	Dr. R. K. Ingle	Ph.D.	Professor	14/09/92	Applied Mechanics	10	30	60
67	Dr. G. N. Ronghe	Ph.D.	Professor	01/07/89	Applied Mechanics	0	32	68
68	Dr. O. R. Jaiswal	Ph.D.	Professor	30/10/98	Applied Mechanics	37	47	16
69	Dr. R. S. Sonparote	Ph.D.	Associate Professor	11/08/92	Applied Mechanics	9	56	35

70	Dr. S. V. Bakre	Ph.D.	Professor	16/05/06	Applied Mechanics	23	35	42
71	Dr. Sangeeta Gadve	Ph.D.	Associate Professor	08/06/12	Applied Mechanics	75	0	25
72	Dr. D. Datta	Ph.D.	Assistant Professor	15/06/10	Applied Mechanics	54	15	31
73	Dr. Ratnesh Kumar	Ph.D.	Assistant Professor	17/04/12	Applied Mechanics	57	14	29
74	Mr. S. B. Borghate	M.Tech.	Assistant Professor	30/08/98	Applied Mechanics	31	54	15
75	Mr. A. Y. Vyavhare	M.Tech.	Assistant Professor	14/06/06	Applied Mechanics	26	59	15
76	Mr. A. P. Khatri	M.Tech.	Assistant Professor	28/11/08	Applied Mechanics	100	0	0
77	Dr. M. Ghosal	Ph.D.	Associate Professor	16/08/88	Humanities & S. Science	11.11	--	88.89
78	Dr. G. N. Nimbarte	Ph.D.	Associate Professor	24/11/8	Humanities & S. Science	100	--	--
79	Radhika Sudhir	M.A.	Teaching Assistant	27/07/13	Humanities & S. Science	100	--	--
80	Navneet Utlawar	M.A.	Teaching Assistant	19/07/13	Humanities & S. Science	100	--	--
81	Priyanka Bansod	M.A.	Teaching Assistant	15/07/13	Humanities & S. Science	100	--	--
82	A. S. Mokhade	M.Tech.	Associate Professor	00/08/96	Computer Science & Engineering	50	25	25
83	Mrs. Deepti Shrimankar	M.Tech.	Assistant Professor	26/11/08	Computer Science & Engineering	39	61	
84	Mrs. Saroj Bhagchandani	M.E.	Teaching Assistant	00/07/13	Computer Science & Engineering	100	--	--
85	Varsha Dhote (Pandagre)	M.Tech.	Teaching Assistant	00/8/13	Computer Science & Engineering	100	--	--
86	Anita Ahirwar	M.Tech.	Teaching Assistant	00/7/13	Computer Science & Engineering	100	--	--
87	Renuka Gowardhan	M.Tech.	Teaching Assistant	00/7/13	Computer Science & Engineering	100	--	--

(Instruction: The institution may list here the faculty members engaged in first year teaching along with other relevant data.)

## 7.1. Academic Support Units (35)

### 7.1.1. Assessment of First Year Student Teacher Ratio (FYSTR) (10)

Data for first year courses to calculate the FYSTR:

Year	Number of students (approved intake strength)	Number of faculty members (considering fractional load)	FYSTR	Assessment = (10x15)/FYSTR (Max. is 10)
CAYm2	696	37.0	18.81	12.54
CAYm1	676	36.18	18.68	12.45
CAY	699	37.18	18.80	12.53
Average	690.33	36.78	18.76	12.507

= 10.00

### 7.1.2. Assessment of Faculty Qualification Teaching First Year Common Courses (15)

Assessment of qualification =  $3 \times (5x + 3y + 2z_0)/N$ , where  $x + y + z_0 \leq N$  and  $z_0 \leq Z$

x = Number of faculty members with PhD

Lab Description	Space, Number of students	Software used	Type of Experiments	Qualify of Instruments	Lab Manuals
First Year Basic Electrical Engineering Lab. (EEP101)	100 square meters  Around 18 students per practical batch	This is a hardware laboratory	Hands-on experiment where students first wire-up and then conduct the experiment. Experiments are designed to verify circuit laws and demonstrate and reinforce concepts taught in theory classes	Good quality instruments are used.  Adequate numbers of instruments are available.	Lab manuals are available for all the experiments.
B.Tech First Year General Lab	Two labs For General and optics experiments separately	NIL Demonstration through LCD Projector	Basic General Physics Experiments	Adequate Quality Four SET for each experiment	Yes, for each experiments
B.Tech 1 <sup>st</sup> Year General	One general Lab covers	Nil	Basic General	Adequate & High Quality	Yes, for each experiment.

Lab	all experiment		Applied Chemistry Experiments	Ample sets for each experiment	
Engineering Drawing Lab.	Three classrooms (each 400 sq-feet area 18 students in each batch Four batches for each section.	Nil	Sheet Work	Wooden Models	NA
Computer Programming Lab	2000 Sq.Ft 20	Turbo C	Programming	Available and adequate	Available and adequate

y = Number of faculty members with ME/MTech/NET-Qualified/MPhil

z = Number of faculty members with BE/BTech/MSc/MCA/MA

N = Number of faculty members needed for FYSTR of 25

Year	x	y	z	N	Assessment of faculty qualification
CAYm2	53	27	2	27.84	37.70
CAYm1	55	28	1	27.04	40.27
CAY	59	25	3	27.96	40.30
Average Assessment of faculty qualification					39.4

**Max = 15**

**7.1.3.** Basic science/engineering laboratories (adequacy of space, number of students per batch, quality and availability of measuring instruments, laboratory manuals, list of experiments) (8)

(Instruction: The institution needs to mention the details for the basic science/engineering laboratories for the first year courses. The descriptors as listed here are suggestive in nature.)

**7.1.4.** Language laboratory (2)

Lab Description	Space, Number of students	Software used	Type of Experiments	Qualify of Instruments	Guidance
Language learning facility	100 licences on Internet	Lingo fx x 25	Language learning 25 foreign languages	Computer	Self learning



(Instruction: The institution may provide the details of the language laboratory. The descriptors as listed here are not exhaustive).

## **7.2. Teaching - Learning Process(40)**

### **7.2.1. Tutorial classes to address student questions: size of tutorial classes, hours per subject given in the timetable (5)**

Provision of tutorial classes in timetable: **NO**

Tutorial sheets provided: **YES**

Tutorial classes taken by faculty and Phd/ MTech students. All Phd/ MTech students are distributed to all the laboratories and faculties.

**Number of tutorial classes per subject per week: Number of students per tutorial class:**

As per requirement of the course coordinator. Tutorials are conducted in the afternoon hours

**Number of subjects with tutorials:**

2<sup>nd</sup> year... 7 subjects

3<sup>rd</sup> year.....6 subjects

4<sup>th</sup> year 6 subjects

(Instruction: Here the institution may report the details of the tutorial classes that are being conducted on various subjects and also state the impact of such tutorial classes).

### **7.2.2. Mentoring system to help at individual levels (5)**

Type of mentoring: **Professional guidance / career advancement / course work specific / laboratory specific / total development**

**Number of faculty mentors:** 16 Faculty Mentors

**Number of students per mentor:** 20 to 25 students per Faculty Mentor

**Frequency of meeting:** At least thrice in a semester, however students are free to contact the faculty mentor as and when required.

(Instruction: Here the institution may report the details of the mentoring system that has been developed for the students for various purposes and also state the efficacy of such system).

### **7.2.3. Feedback analysis and reward / corrective measures taken, if any (5)**

**Feedback collected for all courses: YES**

#### **Specify the feedback collection process:**

The Department of Civil Engineering and its faculty are engaged in a constant endeavour to make student learn better. Hence, the student feed back procedure has been designed and very rigrously excerised at the end of each semester.

The Feed Back Form has been designed in such a way that the evaluation of the teacher, the teaching - learning process and the facilities required for the teaching learning are evaluated. The Form is divided into sections which covers the following areas of evaluation.

The Feed back form is collected by the Faculty member who is inchrge of a particular year, and also who is not teaching the students of that year so that students can freely and fearlessly express their views.

**Percentage of students participating: 90%**

#### **Specify the feedback analysis process:**

The data is compiled for each teacher and the course.

This compiled data is then utilized to understand the status opf the teaching learning process for each course and each year of the program.

#### **Basis of reward / corrective measures, if any:**

- There is no formal reward mechanism for the faculty however, students satisfaction is the only precious reward for teacher.
- Courses where the process of teaching learning is not satisfactory, the Chairman Board of Studies talks individually to the Faculty for bringing necessary changes in the process to enhance the satisfaction level.

#### **Number of corrective actions taken in the last three years:**

As and when there was a need the corrective actions were taken but sufficient care is taken to upkeep the moral and integrity of the faculty member.

(Instruction: The institution needs to design an effective feedback questionnaire. It needs to justify that the feedback mechanism it has developed really helps in evaluating teaching and finally contributing to the quality of teaching).

#### **7.2.4. Scope for self-learning (5)**

(Instruction: The institution needs to specify the scope for self-learning / learning beyond syllabus and creation of facilities for self-learning / learning beyond syllabus.)

Many e-learning material, e-books, journal and magazines are collected and made available to the students at the Institute Library to help the students to build the habit of self-learning. Moreover, provision of Internet in the hostels is facilitated to help the students to learn beyond what is taught in the classroom. Periodic seminars are also created to encourage the student to know about newly published papers and journals.

#### **7.2.5. Generation of self-learning facilities, and availability of materials for learning beyond syllabus (5)**

(Instruction: The institution needs to specify the facilities for self-learning / learning beyond syllabus.)

#### **7.2.6. Career Guidance, Training, Placement, and Entrepreneurship Cell (5)**

(Instruction: The institution may specify the facility and management to facilitate career guidance including counselling for higher studies, industry interaction for training/internship/placement, Entrepreneurship cell and incubation facility and impact of such systems)

#### **7.2.7. Co-curricular and Extra-curricular Activities (5)**

(Instruction: The institution may specify the Co-curricular and extra-curricular activities, e.g., NCC/NSS, cultural activities, etc)

#### **7.2.8. Games and Sports, facilities, and qualified sports instructors (5)**

(Instruction: The institution may specify the facilities available and their usage in brief)

Sports and games are essentials components of human resource development, holding to promote good health, comradeship and spirit of healthy competition, which in turn, has positive and deep impact on the holistic development of the personality of the youth who is a potential source of energy, enthusiasm and inspiration for development, progress and prosperity of the nation. Coaching facilities are provided to the selected students (selected by conducting the selection

trials of various games). Specialized coaches are appointed to train the students going to participate in various West Zone, All India and Inter-Nit Tournaments. Well qualified sports instructors are regularly instruct the students.

**Games and Sports Facilities:-**

**Sports facilities currently available on the Campus**

- One Cricket Ground with six Turf wickets.
- One Football Ground with flood light arrangement.
- Two Volleyball Courts with flood light
- One Badminton Court.
- A Table Tennis Hall
- Three Lawn Tennis Courts.
- One Flood light Basketball Court.
- Well equipped Gymnasium
- Cricket pavilion with the seating capacity of 500 students

## **8. Governance, Institutional Support and Financial Resources (75)**

### **8.1. Campus Infrastructure and Facility (10)**

#### **8.1.A Campus**



***New 1000 Seat Boys Hostel***

The VNIT Campus is spread over an area of 214 acres near Ambazari lake. It presents a spectacle of harmony in architecture and natural beauty. The campus has been organized in three functional sectors;

- Hostels.
- Academic area: Departments, Administrative Buildings, Library and Information
- Center and various central facilities.
- Residential Sector for staff and faculty.

The academic buildings are located fairly close to both, the hostels and the staff quarters. The campus has a full-fledged computerized branch of State Bank of India with ATM facility, Canara Bank, and a Post Office.

The Institute has its own well equipped Health Center with a residential Medical Officer. The specialized services of Psychiatric & Psychological Counsellor, Dietician, Physiotherapist, Pathology lab, Yoga centre. Also medical consultants in Ayurveda and Homeopathy are available. Patients suffering from serious illness / requiring intensive care are referred to the Govt. Medical College and other Hospital nearby and other Health Care Centers duly approved under the CGHS.

An adequately equipped canteen is close to the instruction zone and hostels. Two more cafeterias exist on the campus. The Institute has a well equipped Gymkhana apart from various playgrounds for Tennis, Badminton, Volleyball, Football, Hockey, and Cricket. NCC unit is also located on campus.

Institute is gearing up its infrastructure over the years and is improving its infrastructure. This year, Institute has finished construction of 1000 seat boys hostel. Construction of classroom complex is in place.

### **8.1.B Administration**

As per the provisions of the NIT Act, the Board of Governors (BoG) is responsible for superintendence, direction, and control of the Institute. Thus, the BoG is vested with full powers of the affairs of administration / management and finances of the Institute. Members of the Board represent Government of India, Government of Maharashtra, Industries, and faculty of the Institute. The Director is the principal academic and executive officer of the Institute. Besides the BoG, the Senate, the Finance Committee (FC) and the Building and Works Committee (BWC) are statutory committees and therefore important authorities of the Institute.

Apart from the above statutory committees, the Board has the power to constitute various sub-committees for smooth and efficient administration. Thus, the Board has constituted the Stores Purchase Committee (SPC), Grievance Committee (GC), and Special Cell. The SPC administers the centralized procurement of equipment and material whereas the GC provides a platform to hear the views of staff and faculty on grievances. The Special Cell functions to protect the interest of backward-class candidates through procedural, institutional, and other safeguards.

### **8.1.C Academic Programmes**

The Institute offers 9 Under-Graduate programs viz., B. Tech. in Chemical, Civil, Computer Science, Electrical and Electronics, Electronics and Communication, Mechanical, Metallurgical and Materials and Mining Engineering and Bachelor of Architecture.

The Institute also offers 16 Post-Graduate Full time programs (2 years duration) viz., M. Tech. in Industrial Engg., Heat Power Engg, CAD-CAM, Materials Engg, VLSI Design, Communication System Engineering, Computer Science Engg., Industrial Engg., Integrated Power System, Power Electronics and Drives, Structural Engineering, Structural Dynamics and Earthquake Engineering, Environmental Engineering, Water Resources Engineering., Construction Technology and Management, Transportation Engineering and Urban Planning. The Institute also offers M.Tech. by research program in all engineering departments, Ph D (Full/Part Time).

Institute has started M.Sc. programs in Chemistry, Mathematics and Physics from current year.

The Doctoral Research is done in all Engineering and Sciences departments. Institute is a recognized centre under QIP scheme for Ph.D. program in Electrical and Metallurgical & Materials Engineering department and for M. Tech. program in Electrical and Civil Engineering departments.

#### **8.1.1. Maintenance of academic infrastructure and facilities (4)** (Instruction: Specify distinct features)

#### **Maintenance of Infrastructure & facilities :**

The college has an extensive Infrastructure spread over 214 acres comprising of Academic Buildings, Departments, Lecture Theatres, Auditorium, Food outlets, student Residences, faculty and staff quarters, Guest House, sport

fields, stadia, roads, power supply systems, Roads, Water supply, selvage disposal Network etc. A full fledged Estate Maintenance section is operational since the inception of the college. For civil maintenance as well as the supervision of new construction, Electrical Maintenance including Back up generation by Diesel Generator Telecom and Data network (ISDN & Optical Fibre) is taken care by independent units. A security section supervises the maintenance of Law & order on the campus and vicinity.

Annual Maintenance contract for academic infrastructures including computing facility, UPS and air-conditioning (facility management at Institute level)

Annual maintenance contract or on-call basis maintenance service is affected for critical level laboratory equipment. Many of the critical equipment are procured with 3 years warranty.

Assistant Engineer has the responsibility to maintain the Institute campus under the supervision of Dean (Planning & Development). Assistant Estate Engineer coordinates and oversees the functions of the buildings, water supply and electrical wings.

**8.1.2. Hostel (boys and girls), transportation facility, and canteen (2)**

Hostels	No,	No. of Rooms	No. of Students accommodated
Hostel for Boys	9	3508	2986
Hostel for Girls	2	522	555

**8.1.3. Electricity, power backup, telecom facility, drinking water, and security (4)**

**8.1.3..A Electricity:**

As a self sufficient campus which is also a minor township, the entire energy requirements are under own control of the Institute. The Institute is an HT consumer getting supply from the State Electricity Board at 11 kv by UG cable/as a high priority express Feeder and is exempt from load shedding interruptions. The current maximum load demand is of the order of 1000 KVA while the total connected load is estimated at 1500 Kw at substantially unity power factor. The 200 acre Campus is served by three substation having 3 transformers of 400 KVA each and a smaller transformer of 250 KVA. The Internal distribution to various units of the campus such as Hostel, Academic Bldgs., Residential area is entirely by underground LT cabling. As a backup to the Electricity Board supply due to unforeseen reasons beyond institute's control, a set of 2 Diesel Generators each of 250 KVA capacity is available for serving essential load such as computer/Network center

Library/Administration Bldg. etc.

The entire Electrical Installation is maintained in house under the supervision of coordinator – Electrical maintenance who is usually a senior Professor in Electrical Engg. Deptt. The Campus roads are also having energy efficient lighting which under automatic timer control device. The entire installation is annually checked by the statutory authority of Electrical Inspector for safety, reliability and Earthing etc. The average Electrical consumption of the campus is around 112000 KWh units over one calendar year with hostels being significant part of the overall load. As a part of the modernisation solar water heaters are installed in all hostels and plan are underway to introduce solar PV as well LED lights to significantly reduce Main Power from Electric supply utility.

#### **8.1.3.B Water Supply Details:**

The college campus gets its water supply from Nagpur Municipal Corporation as well as from it's own wells. To ensure regular and uninterrupted supply to all users a network of 9 underground sumps (reservoirs) are created having total storage capacity of 12-85 lakh litres of Potable Drinking Water. The average daily consumption is 6.50 lakh litres, mains water supply is limited to daytime hours from 7.45 am to 11.00 a.m. to individual Buildings overhead tanks.

#### **8.1.4 C Campus Security Section:**

The VNIT campus has a full fledged security section having 12 permanent employees. The section is headed by Security Officer assisted by Asstt. Security Officer and 10 permanent cadre service guards. This is supplemented by designated guard units provided by a private security agency supervised by college security personal. All Major Installations such as Entry gates, Hostels (Boys & girls), Library and other sections are provided round the clock security supplemented by walkie-talkie phone system.

### **8.2. Organisation, Governance, and Transparency (10)**

#### **8.2.1. Governing body, administrative setup, and functions of various bodies (2)**

- |                                 |    |              |
|---------------------------------|----|--------------|
| (i) Board of Governors          | -- | Annexure - A |
| (ii) Senate                     | -- | Annexure - B |
| (iii) Finance Committee         | -- | Annexure - C |
| (iv) Building & Works Committee | -- | Annexure – D |



(A) **Board of Governors**

Sr. N	Name	Designation
1.	Dr. S. K. Joshi, Distiguated Scientist, New Dellhi-	Chairman
2.	Smt. Amita Sharma (IAS), New Delhi.	Member
3.	Shri A. N. Jha, Jr. Secretary & F., HRD, New Delhi.	Member
4.	Prof. (Mrs.) Joyshree Roy, Prof. DOE, Kolkata	Member
5.	Shri. Pramod Chaudhary, Executive Chairman, PUNE	Member
6.	Prof. S.C . Sahasrabudhe, Director, D.A.I.I.C.T. Gandhinagar	Member
7.	Pfor. A. G. Kothari, Prof. EED, NGPUR	Member
8.	Mr. I. L. Muthreja, Assott. Prof. M.E.D., Ngpur	Member
9.	Dr. T. Srinivasa Rao, Director, VNIT, Nagppur	Member
10.	Dr. B. M. Ganveer, Registrar, VNIT, Nagpur.	Secretary

(B) **Senate**

1.	Dr. N. S. Chaudhari, Director, VNIT, Nagpur	Chairman
2.	Prof. S. V. Bhat, Deptt. of Physics, IIS, Bangalore – 560 012	Member
3.	Dr. T. S. Sampath Kumar, Asso. Prof., Deptt. of M.M.S.	Member
4.	Prof. (Ms.) R. B. Nair, HD,. H & S.S.,IIT, Delhi	Member
5.	Dr. Rajesh Gupta, Dean (Planning & Development), VNIT, Nagpur	Member
6.	Dr. R. K. Ingle, Dean (Faculty Welfare), VNIT, Nagpur	Member
7.	Dr. Animesh Chatterjee, Dean (Research & Consultancy), VNIT, Nagpur	Member
8.	Dr. R. M. Patrikar, Dean (Academics), VNIT, Nagpur	Member
9.	Dr. A. P. Patil, Dean (Students Welfare), VNIT, Nagpur	Member
10.	Dr. S. V. Bakre, Head, Deptt. of Applied Mechanics, VNIT, Nagpur	Member
11.	Prof. L. M. Gupta, Professor of Structural Engineering, VNIT, Nagpur	Member

12	Prof. O. R. Jaiswal, Professor of Structural Engineering, VNIT, Nagpur	Member
13	Dr. M. M. Mahajan, Professor of Structural Engineering, VNIT, Nagpur	Member
14	Dr. G. N. Ronghe, Professor of Structural Engineering, VNIT, Nagpur	Member
15	Dr. S. A. Mandavgane, Head, Chemical Engg. Deptt., VNIT, Nagpur	Member
16	Dr. V. A. Mhaisalkar, Head, Civil Engg. Deptt., VNIT, Nagpur	Member
17	Dr. A. D. Pophale, Professor of Civil Engg., VNIT, Nagpur	Member
18	Dr. Y. B. Katpatal, Professor of Civil Engg., VNIT, Nagpur	Member
19	Dr. H. M. Suryawanshi, Head, Deptt. of Electrical Engg., VNIT, Nagpur	Member
20	Dr. A. G. Kothari, Professor of Electrical Engg., VNIT, Nagpur	Member
21	Dr. M. V. Aware, Professor of Electrical Engg., VNIT, Nagpur	Member
22	Dr. K. L. Thakre, Professor of Electrical Engg., VNIT, Nagpur	Member
23	Dr. K. D. Kulat, Head, Deptt. of Electronics Engg., VNIT, Nagpur	Member
24	Dr. A. G. Keskar, Professor of Electronics & Comm., VNIT, Nagpur	Member
25	Dr. R. B. Deshmukh, Professor of Electronics Engineering, VNIT, Nagpur	Member
26	Dr. A. S. Gandhi, Professor of Electronics Engineering, VNIT, Nagpur	Member
27	Dr. S. R. Sathe, Head, Deptt. of Computer Sc. & Engg., VNIT, Nagpur	Member
28	Dr. C. S. Moghe, Professor of Computer Science Engg., VNIT, Nagpur	Member
29	Dr. I. K. Chopde, Head, Deptt. of Mechanical Engg., VNIT, Nagpur	Member
30	Dr. P. M. Padole, Professor of Mechanical Engg., VNIT, Nagpur	Member
31	Dr. A. M. Kuthe, Professor of Mechanical Engg., VNIT, Nagpur	Member
32	Dr. S. G. Sapate, Head, Deptt. of Met. & Mat. Engg., VNIT, Nagpur	Member
33	Dr. R. K. Paretkar, Professor of Met. & Mat. Engg., VNIT, Nagpur	Member
34	Dr. S. U. Pathak, Professor of Met. & Mat. Engg., VNIT, Nagpur	Member
35	Dr. D. R. Peshwe, Professor of Met. & Mat. Engg., VNIT, Nagpur	Member
36	Dr. R. R. Yerpude, Head, Deptt. of Mining Engg.,	Member

	VNIT, Nagpur	
37	Prof. S. Shringarputale, Professor of Mining Engg., VNIT, Nagpur	Member
38	Ms. Alpana Dongre, Head, Deptt. of Architecture, VNIT, Nagpur	Member
39	Dr. V. S. Adane, Professor of Architecture, VNIT, Nagpur	Member
40	Dr. (Mrs.) Sujata Patrikar, Head, Deptt. of Appl. Physics, VNIT, Nagpur	Member
41	Dr. V. K. Deshpande, Professor of Applied Physics, VNIT, Nagpur	Member
42	Dr. (Mrs.) Anupama Kumar, Head, Deptt. of Chemistry, VNIT, Nagpur	Member
43	Dr. S. S. Umare, Professor of Chemistry, VNIT, Nagpur	Member
44	Dr. G. P. Singh, Head, Deptt. of Mathematics, VNIT, Nagpur	Member
45	Dr. (Ms) M. Ghoshal, Head, Deptt. of Humanities, VNIT, Nagpur	Member
46	Dr. S. B. Thombre, Professor of Mech. Engg & i/c T&P, VNIT, Nagpur	Member
47	Dr. D. H. Lataye, Chief Warden, VNIT, Nagpur	Member
48	Dr. B. M. Ganveer, Registrar, VNIT, Nagpur	Secretary

(C) **Finance Committee**

1.	<b>Dr. S. K. Joshi</b> , Distinguished Scientist (CSIR) & Vikram Sarabhai Professor of JNCASR, New Delhi.	Chairman
2.	Shri Rajesh Singh, Director Deptt. Higher Education, New Delhi	Member
3.	Shri Navin Soi, Director, Ministry HRD, New Delhi.	Member
4.	Prof. S. C. Sahasrabudhe, Director D.A.I.I.C.T., Gandhinagar	Member
5.	<b>Prof. A. G. Kothari</b> , Professor, Electrical Engineering Department, VNIT, Nagpur	Member
6.	Dr. N. S. Chaudhari, Director, VNIT, Nagpur	Member
7.	<b>Dr. B. M. Ganveer</b> Registrar, VNIT, Nagpur	Member-Secretary

(D) **Building & Works Committee**

1.	Dr. N. S. Chaudhari, Director, VNIT, Nagpur	Chairman
2.	Shri Rajesh Singh, Director Director HMHRD, New Delhi	Member
3.	Shri Navin Soi, Director IFD, New Delhi	
4.	<b>Prof. S. C. Sahasrabudhe, Director D.A.I.T, Gandinagar</b>	Member
5.	<b>Dr. Rajesh Gupta</b> Dean (P&D), V.N.I.T., Nagpur	Member
6.	<b>Mr. R. K. Naik</b> , Superintending Engineer (Civil), Central P.W.D., , Nagpur-440 006	Member
7.	<b>Shri Arvind Garg</b> , Suptd. Engineer (Electrical) NAGPUR – 440006	Member
8.	<b>Chief Engineer</b> , Public Works Department, NAGPUR – 440001	Member
9.	<b>Supdt. Engineer (Electrical)</b> , Public Works Department, NAGPUR – 440001	Member
10.	<b>Dr. B. M. Ganveer</b> Registrar, VNIT, Nagpur	Member- Secretary

**Other information is as under -**

**Statutory Committees -**

Name of the Committee	Frequency of the meetings	Attendance
Board of Governors	4 in a year	Average 70%
Finance Committee	3 in a year	Average 80%
Building & Works Committee	4 in a year	Average 80%
Senate	4 in a year	Average 90%

Other than the above Committees, there in also the Staff Selection Committee (Statutory) for Selection of faculty and non-faculty employees which meets as and when necessary. This is a standard composition of the committee which includes official & Non official members.

The last Staff Selection Committee for recruitment of faculty posts was held in 2012 and for non-faculty posts in 2008.

In addition the board has constituted following Committees for compliance with rules & regulations.

- 1) Special Cell : To ascertain the Goal reservation policy is observed scrupulously. No meeting of Special Cell held during current

year i.e. 2013.

- 2) Stores Purchase Committee: To assist the Director in procurement of item/equipment/material costing beyond 10 Lakhs.

Total 3 meetings are held during current year i.e. 2013

- 3) Grievance Cell : To address the Grievances of all the employees.

No meeting was held during current year 2013.

- 4) Women's Cell : To address the Grievances of working women.

Two meetings held during 2013.

### 8.2.2. Defined rules, procedures, recruitment, and promotional policies, etc. (2)

(Instruction: List the published rules, policies, and procedures; year of publications; and state the extent of awareness among the employees/students. Also comment on its availability on Internet, etc.)

8.2.3, 8.2.4 Most of the information viz.. Act, Statutes, constitution of various Committees, Academic Programmes, grievance mechanism, and minutes of all Statutory Committees are placed on Institute web-site and updated from time to time.

### 8.2.3. Decentralisation in working including delegation of financial power and grievance redressal system (3)

(Instruction: List the names of the faculty members who are administrators/decision makers for various responsibilities. Specify the mechanism and composition of grievance redressal system, including faculty association, staff-union, if any.)

## LIST OF DELEGATION OF FINANCIAL POWERS

Sr.No.	Particulars	Functionaries	Proposed Financial Power
01.	All kinds of expenditure under plan and non plan budget	Director	Up to 8 Crores
02.	All kinds of expenditure under plan and non plan budget	Deputy Director	Upto 50 Lakhs
03.	All kinds of purchases & other expenditure from Sponsor Research, Projects, Schemes and Consultancy Funds	Dean (R&C)	Upto 10 Lakhs
04.	For Purchase of Consumables from Projects, Schemes and Consultancy Fund	Principal Investigator	Upto 2 Lakhs (for Consumables only)

05.	1. Stores, spares, accessories under allotted operating grant (Non Plan) 2. Purchases under allotted Plan Grant,	Heads of Deptts. Prof-in-Charge (T&P), Librarian	Upto 2 Lakhs
06.	All Expenditure related to student's activities, including sports.	Dean (St. Welfare)	Upto 2 Lakhs
07.	Purchases, Payments of scholarship & other allied expenditure within approved & allotted grant of the year. All related expenditure of PG students & research scholars within approved budget.	Dean (Academics)	Upto 10 Lakhs
08.	Expenditure related to their operational expenses (Office, small equipment, consumables etc.	All Deans	Upto Rs. 2 Lakhs
09.	Expenditure for campus development, minor repairs, cleaning, minor repair of roads, parks, convocation and miscellaneous for which the administrative approval is accorded and fund is allotted for the purpose.	Dean (P&D)	Upto Rs. 2 Lakhs
10.	Purchases of Journals, consumables, spares and accessories etc. form budgetary allocation of the year	Chairman, Library Committee	Upto Rs. 2 Lakhs
11.	Expenditure for medicine/consumables/equipments directly related to Health Service expense.	Medical Officer	MO: upto Rs. 1 Lakhs in each case, with Ceiling of Rs. 5 lakhs per year
12.	[i] Payment of Telephone bill FAX, Bill Electricity/bill, Water bill etc., [ii] Purchases of equipment, uniform, consumables, stationeries, spares & accessories. for registry/requirement for departments not covered above within allotted grant of the year.	Registrar	Full power of [i] and Upto Rs. 2 Lakh
13.	For contingency expenditure	Dy. Registrar, Ass. Registrar (Independent Charges)	Up to Rs. 10000

List of faculty members who are administrators/decision makers for various jobs –

**Deans**

- \* Dean (Planning and Development) -- Dr. S. R. Sathe
- \* Dean (Faculty Welfare) -- Dr. R. K. Ingle
- \* Dean (Research and consultancy) -- Dr. H. M. Surywanshi
- \* Dean (Academics) -- Dr. O. R. Jaiswal
- \* Dean (Students Welfare) -- Dr. G. P. Singh

The Institute Grievance Redressal Committee is constituted with the following members:-

- \* Dr. M. M. Mahajan, Prof. of Structural Engg. -- Chairman
- \* Dr. Aniket M. Deshmukh, Assoc Prof. of Architecture -- Member
- \* Shri Askok Thakur, Senior Assistant -- Member
- \* Shri C. V. Chalpati Rao -- Member
- \* Shri V. S. Kapse, Liaison Officer, SC/ST -- Member
- \* Dr. A. Andhare, Associate Prof. of Mech. Engg. -- Member-Secretary

#### 8.2.4. Transparency and availability of correct/unambiguous information (3)

(Instruction: Availability and dissemination of information through the Internet. Information provisioning in accordance with the Right to Information Act, 2005).

All relevant information are made available through website.

Information is made available through emails and circulars.

The RTI Cell is constituted in accordance with the provisions of Right to Information Act, 2005 as follows-

- Public Information Officer -- Dr. B. M. Ganveer, Registrar
- First Appellate Authority -- Dr. S. R. Sathe, Dean, (P&D)
- Second Appellate Authority -- Dr. N. S. Choudhary, Director

#### 8.3. Budget Allocation, Utilisation, and Public Accounting (10)

Summary of current financial year's budget and the actual expenditure incurred (exclusively for the institution) for three previous financial years.

In Rupees

Item	Budgeted in CFY (2013-14)	Expenses in CFY (till 30-09-2013)	Expenses in (2012-13)	Expenses in (2011-12)
Infrastructural built-up	2,65,54,000	36,13,35,022	2,81,64,291	15,95,93,770
Library	1,50,00,000	36,13,208	1,90,18,807	1,29,71,122
Laboratory equipment	7,40,50,000	1,72,15,522	4,32,85,956	3,99,33,386
Laboratory consumables	9,00,000	3,28,380	34,54,624	14,68,336
Teaching and non teaching staff salary	18,68,00,000	24,03,26,847	44,34,60,400	30,58,08,851
R&D				
Training & travel	3,00,000	8,25,317	11,52,857	12,93,657
Other, specify	2,76,52,000	3,35,20,388	7,88,07,806	6,16,68,294
Total	30,47,02,000	65,71,64,684	61,7340,741	58,27,37,416

### 8.3.1. Adequacy of budget allocation (4)

(Instruction: Here the institution needs to justify that the budget allocated over the years was adequate.)

The Institute receives grant-in-aid from the Government of India based on the budget formulated by it. There is enough funds made available by the Government of India for Plan and Non-Plan activities. Infrastructure facilities are created on priority basis based on the available fund from the Government of India.

### 8.3.2. Utilisation of allocated funds (5)

(Instruction: Here the institution needs to state how the budget was utilised during the last three years.)

The utilization of allocated fund is satisfactory as can be seen from above table no. 8.3.

### 8.3.3. Availability of the audited statements on the institute's website (1)

(Instruction: Here the institution needs to state whether the audited statements are available on its website.)

The account of the Institute is audited by a team of auditors from the Comptroller & Auditor General of India and the Audit Report is prepared by the CAG Office. A copy of the Report is given to the Institute. Under the provision of the National Institutes of Technology Act 2007, the Audit Report of the Institute account is placed before the Parliament every year. Till its placement before both the Houses of Parliament and its considerations, the Report remains confidential.

## 8.4. Programme Specific Budget Allocation, Utilisation (10)

Summary of budget for the CFY and the actual expenditure incurred in the CFYm1 and CFYm2 (exclusively for this programme in the department):

Items	Budget in CFY	Actual expenses in CFY *	Budgeted in CFYm1	Actual Expenses in CFYm1 *	Budgeted in CFYm2	Actual Expenses in CFYm2
	Budgeted in 2012-13 in INR	Actual expenses in 2012-13 in INR	Budgeted in 2011-2012 in INR	Actual Expenses in 2011-2012	Budgeted in 2010-2011	Actual Expenses In 2010-2011
Laboratory Equipments	20 lacs	1902851	20 lacs	2278164	18 lacs	1723760
Software purchase	40 lacs	3846628	5 lacs	490819	2 lacs	206000
Laboratory consumables	6 lacs	654252	1 lacs	49297	1 lacs	116620
R&D	0	0	0	0	0	0
Maintenance and spares	1 lacs	-	1 lacs	88258	1 lacs	79888
Travel	0 lacs		0 lacs		0 lacs	



Miscellaneous expenses for academic activities	10 lacs	1236184	1 lacs		0.5 lacs	
Total	77 lacs	7639915	28 lacs	2906538	22.5 lacs	2126268

\* The amounts shown under expenditure do not include many items of routine expenses met from Centralised Institutional Source 'such as AMC/Computer Consumables and student related travel expenditure which, however, are aggregated in The Institutionla Income Expenditure statement in Part I - item I-10.  
(Instruction: The preceding list of items is not exhaustive. One may add other relevant items if applicable.)

**8.4.1. Adequacy of budget allocation (5)**

(Instruction: Here the institution needs to justify that the budget allocated over the years was adequate.)

**8.4.2. Utilisation of allocated funds (5)**

(Instruction: Here the institution needs to state how the budget was utilised during the last three years.)

Fund provided to the department is properly used to develop the infrastructure of the department to achieve a better programme outcome.

**8.5. Library (20)**

**8.5.1. Library space and ambience, timings and usage, availability of a qualified librarian and other staff, library automation, online access, networking, etc. (5)**

(Instruction: Provide information on the following items.).

Carpet area of library (in m2) Reading space (in m2) = 6400 m<sup>2</sup>

Number of seats in reading space = 150 (Night Reading)+ 200 (Library) = 300

Number of users (issue book) per day = 512

Number of users (reading space) per day =468

Timings: During working day, weekend, and vacation = 360 days, timings 8:30 a.m. to 9:30 p.m.

Number of library staff = 23 (08 permanent)

Number of library staff with degree in Library Management = 21,

Computerisation for search = 21

indexing, issue/return records Bar coding used = yes

Library services on Internet/Intranet INDEST or other similar membership

Archives

### 8.5.2. Titles and volumes per title (4)

	Number of new titles added	Number of new editions added	Number of new volumes added
CAYm2 2010-11	950	4,365	1,08,694
CAYm1 2011-12	2,226	4,034	1,13,806
CAYm 2012-13	1,060	6,049	1,27,383

### SUBJECT WISE TITLES (TILL 31<sup>ST</sup> MARCH 2011)

<b>Sr.No.</b>	<b>Subject</b>	<b>Title</b>	<b>Volume</b>
01.	A. M.	281	416
02.	Archi.	5019	8728
03.	Chemical	2386	3989
04.	Che.	3085	6138
05.	Civil	8529	7741
06.	ComSc	7741	10748
07.	Electro	5022	8094
08.	Clectri	6133	13254
09.	Hum	1223	1782
10.	Math	2982	5497
11.	Mech.	6960	13449
12.	Met.	6007	9179
13.	Min.	4648	6422
14.	Phy.	1616	6270
15.	L.S. & H.	99	99
<b>TOTAL</b>		<b>61711</b>	<b>108694</b>

SUBJECT WISE TITLE (TILL 31<sup>ST</sup> MARCH 2012)

<b>Sr.No.</b>	<b>Subject</b>	<b>Title</b>	<b>Volume</b>
01.	A. M.	355	605
02.	Archi.	5154	8937
03.	Chemical	2512	4352
04.	Che.	3182	6398
05.	Civil	8667	15016
06.	ComSc	7990	11286
07.	Electro	5093	8347
08.	Electri.	6475	14130
09.	Hum	1476	2307
10.	Math	3176	5911
11.	Mech.	7055	13710
12.	Met.	6193	9526
13.	Min.	4661	6461
14.	Phy.	1793	6665
15.	L.S. & H.	155	155
<b>TOTAL</b>		<b>63937</b>	<b>113806</b>

SUBJECT WISE TITLES (TILL 31<sup>ST</sup> MARCH 2013)

<b>Sr.No.</b>	<b>Subject</b>	<b>Title</b>	<b>Volume</b>
01.	A. M.	440	2176
02.	Archi.	5265	9350
03.	Chemical	2634	4986
04.	Che.	3261	8079
05.	Civil	8780	15730
06.	ComSc	8079	14130
07.	Electro	5267	9962
08.	Clectri	6531	15165
09.	Hum	1488	2744
10.	Math	3236	6548
11.	Mech.	7118	14449
12.	Met.	6239	10114
13.	Min.	4676	6856
14.	Phy.	1806	7145
15.	L.S. & H.	177	177
<b>TOTAL</b>		<b>64997</b>	<b>127311</b>

### 8.5.3. Scholarly journal subscription (3)

Details		CFY 2013	CFYm1 2012	CFYm2 2011	CFYm3 2010
Science	As soft copy	00	02	02	01
	As hard copy	18	21	20	17
Engg. And Tech.	As soft copy	736	00	04	01
	As hard copy	51	86	106	110
Pharmacy	As soft copy	x			
	As hard copy				
Architecture	As soft copy	00	00	00	00
	As hard copy	16	18	24	24
Hotel Management	As soft copy				
	As hard copy				

(1) 05 Subject collection with 694 title of Elsevier.

(2) ACS 41 title of Chemical Engg. Web editions for the year 2013.

### 8.5.4. Digital Library (3)

Availability of digital library contents: Available

If available, then mention number of courses, number of e-books, etc. Availability of an exclusive server: Yes

Availability over Intranet/Internet: Yes

Availability of exclusive space/room: Yes

Number of users per day: (1) Issue counter 512 (2) Reference section 245 (3)

Periodical section 167 (4) Reading Room section 468 (5) Stock Room section 182 (6)

Reprography section 376 (7) CD-ROM use 098

### 8.5.5. Library expenditure on books, magazines/journals, and miscellaneous contents (5)

Year	Expenditure				Comments, if any
	Book	Magazines/journals (for hard copy subscription)	Magazines/journals (for soft copy subscription)	Misc. Contents	
CFYm2 2011	41.42 Lacs (4813)	48,49,686.00	2,31,158.00		
CFYm1 2012	53.32 Lacs (5112)	49,73,906.00	1,56,054.00		
CFY 2013	77.67 Lacs (13505)	21,61,376.00	60,62,510.00		

### Virtual Class Room:

DETAILS :-

Money Given By National Informatics Center (NIC):-

- Total Project Cost of Virtual Class-Room -- Rs. 32,26,524/-
- Civil Work for Virtual Class Room -- Rs.10,00,000/-
- Technical Assistant for Virtual Class Room -- Rs. 1,80,000/-
- Bandwith:-

Speed for Video only 50 mbps

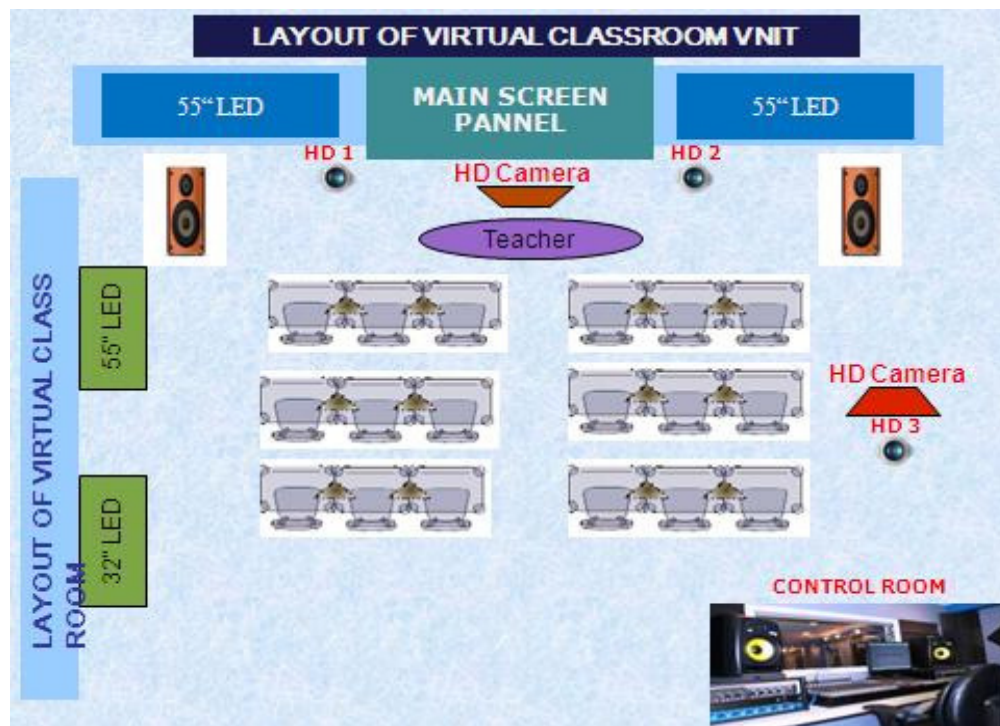
Speed for net only 50 mbps

Total Bandwidth 100 mbps

- Portal of NKN <http://www.nkn.in/>
- IP Address for NKN;-
  - 10.119.19.194
  - 10.119.19.192/27 such Range is also allocated

Contact Details;-  
1] VNIT Co-ordinator;- Prof. V. J. Abhyankar,  
2] VNIT Technical Assistant;- Mr. Rahul Hepat,  
Mr. A.A. Hardas

#### 8.5.5.1 Layout of Virtual Classroom



## **8.6. Internet (5)**

Name of the Internet provider: BSNL

Available bandwidth: Broadband

Access speed: Gbps and 16 Mbps: Good Access Speed

Availability of Internet in an exclusive lab: Yes

Availability in most computing labs: Yes

Availability in departments and other units: Yes

Availability in faculty rooms: Yes

Institute's own e-mail facility to faculty/students: Yes

Security/privacy to e-mail/Internet users: Yes

(Instruction: The institute may report the availability of Internet in the campus and its quality of service.)

### **8.6.1 Network Center Information;-**

- Network Center provides a variety of Services. Network Center administers and manages the entire Campus Computer Network which includes departments, sections computer center, administrative building, library, Guest house, health center, NCC Section and Auditorium along with Network Center and quarters.
- Network Center has three leased line (LL) connections 10 Mbps 75 Mbps and 42 Mbps which is distributed all over campus like departments, sections, computer center, administrative building. Guest house, health center, NCC Section, Auditorium and quarters along with Network Center, Currently NKN LL provided by NMEICT for Internet is 50 Mbps.
- Network Centre monitors bandwidth usage continuously and any problems in usage are rectified with the help of ISP (Internet Service Provider).
- Network Center has in-house web server, mail server, proxies and application server along with oracle server. We provide Web-based Email open source that enables all the users to access their mailbox from anywhere (inside or outside VNIT Nagpur) via the Internet, an institute wide. We mostly encourage use of free and open software like GNU/Linux distributions.
- Network Center provides advanced and special purpose softwares such as ANSYS, MATLAB, EXATA and AUTOCAD as well as NPTEL Videos for all the inside users in campus. Microsoft OS Software License for servers. Network Center also host mirrors of freeware softwares for all campus users. The documentation is also provided for special purpose software regarding installation on end user computer. Powerlingo language software is available for the benefit of students.
- The centralized installation of quick Heal Antivirus software is provided for all campus users. Network center has hardware such as core switch, blade chassis, Blade server, Rack mount server, SAN Storage, Lenovo All

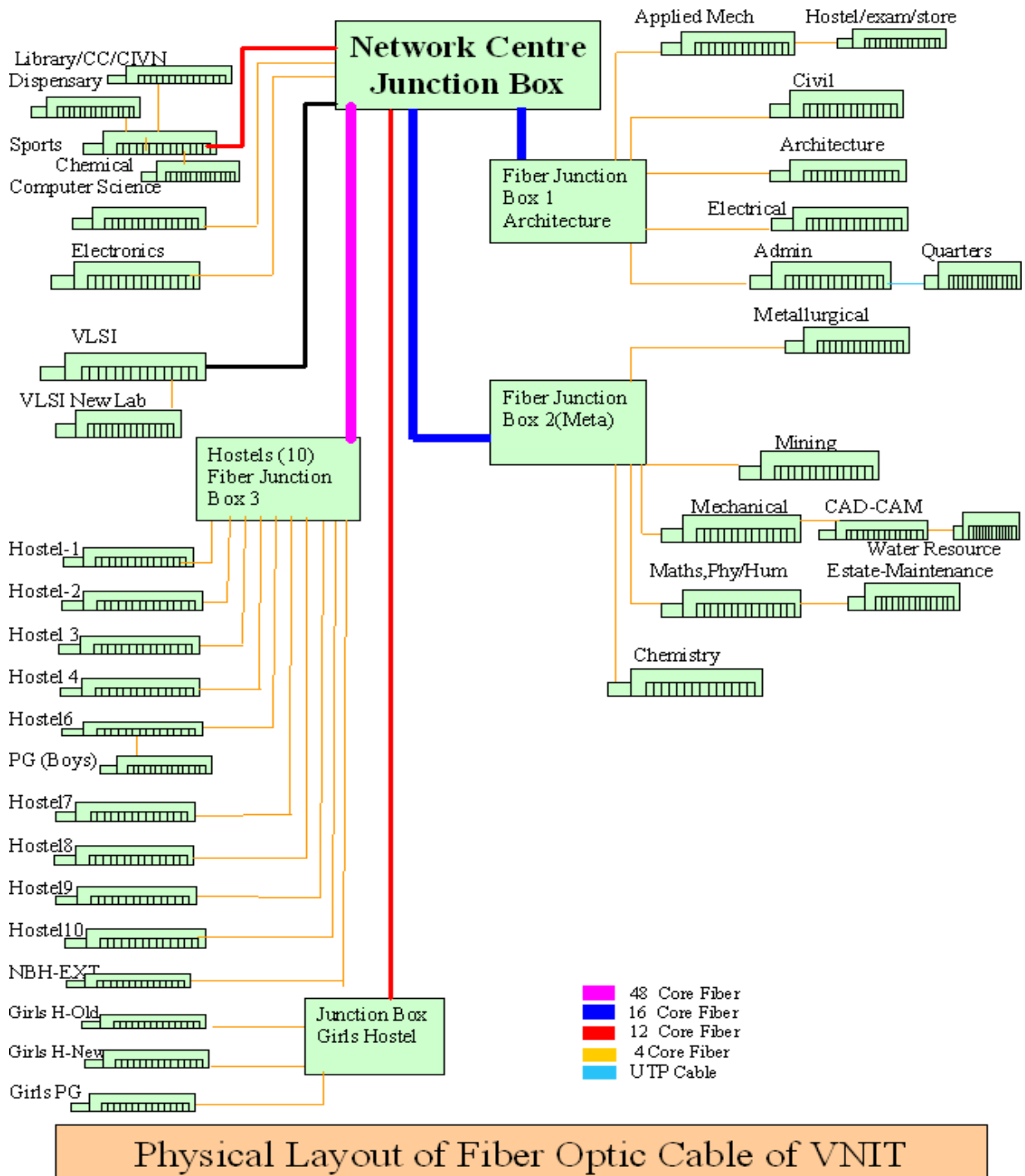
in one Desktops, HP Laserjet M 1536 DNF Printer, Lenovo MAKE Desktop, HP Dual CPU Server, Netscreen Firewall, Check Point UTM, HP-ML-370 G4 Server Dual Processor.

- The approximate cost of hardware is around 1 crore 60 lakhs only (Rs. 1,60,00,000/-) The approximate cost of software is rupees Two Lakh eighty thousand only (Rs. 280000/-) Computer Hardware AMC is outsourced. The cost of annual maintenance charges on computer hardware is approximately two lakhs (Rs. 2,00,000).
- The annual charges of Reliance LL is approximately twenty five lakhs (Rs. 25,00,000) and that of BSNL LL is around ten lakhs (Rs. 10,00,000/-).
- Network Center has one permanent staff and three adhoc staff - 11 and recurring charges is as under –

AMC	--	2.0 L
Reliance LL	--	25.0 L
BSNL	--	10.0 L

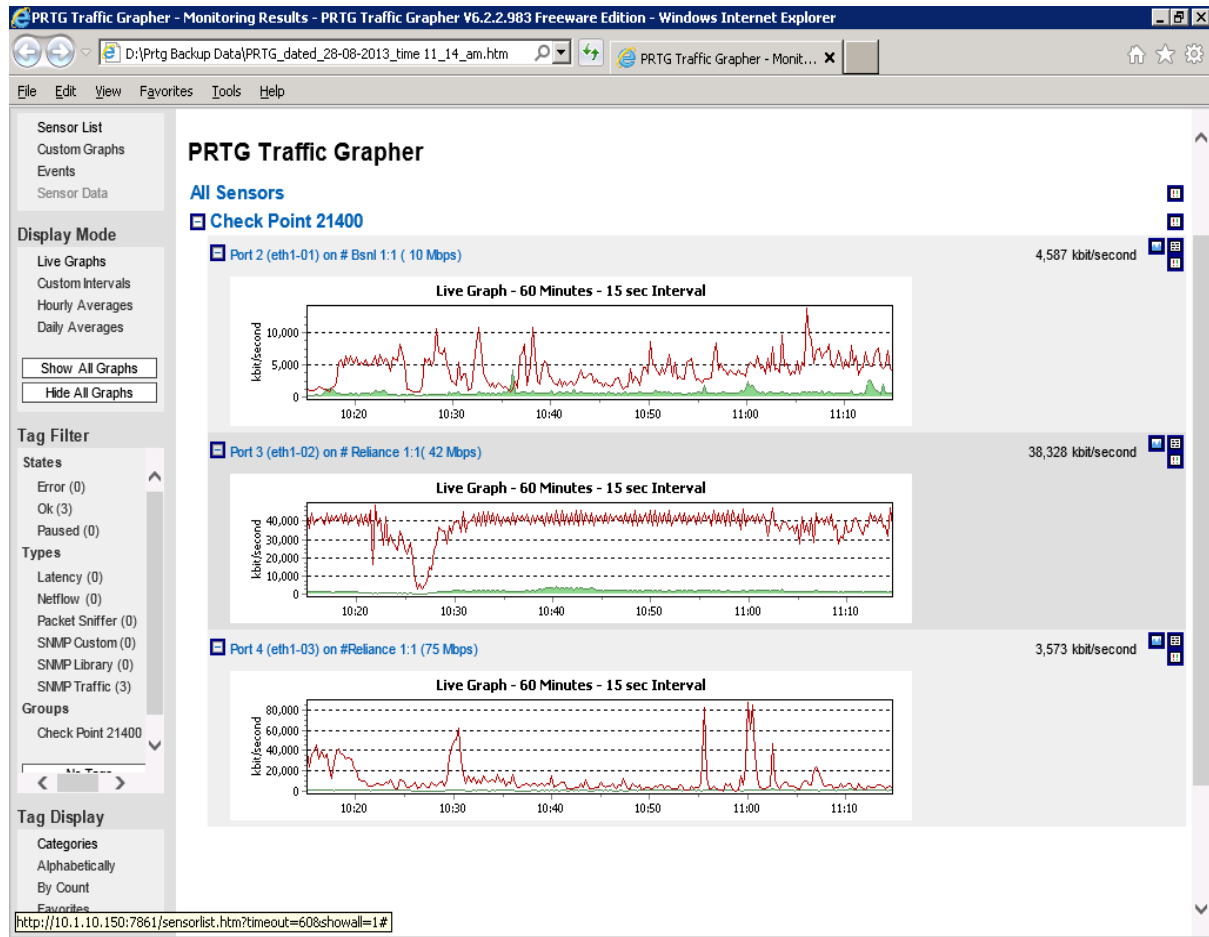
## 8.6.2 Physical Layout of Fiber Optic Cable of VNIT

Figure I





### 8.6.3 PRTG Traffic Grapher Figure II



## 8.7. Safety Norms and Checks (5)

### 8.7.1. Checks for wiring and electrical installations for leakage and earthing (1)

Sr.No.	Particulars	No. of Exits
1	Auditorium	7.00
2	Large Classrooms/Laboratories	2.00
3	Library	2.00

**8.7.2.** Fire fighting measurements: Effective safety arrangements with emergency multiple exits and ventilation/exhausts in auditoriums and large classrooms/laboratories, fire fighting equipment and training, availability of water, and such other facilities (1)

**Adequate ventilations and multiple exits are provided in all academic buildings, laboratories.**

**Fire Fighting Measures:**

- 1] We have fire extinguishers (mega mess, hostel blocks, in CAD/CAM, Department, some are still in propose)
- 2] As per chief advisor of fire audit committee S.T. Chaudhari's advice we have DCP, CO2 pressure extinguishers are placed (fire hydride system is not there)
- 3] Emergency safety arrangements: No
- 4] Multiple exits and ventilation/exhausts in auditorium and large labs/classrooms: Yes
- 5] A number of fire extinguishers are located at various sensitive locations throughout the campus. A total of 16 stations containing different types of Fire fighting media such as Foam, Coz, W/C and DCP are functional and under continuous surveillance for dealing with any fire related emergency.

**8.7.3.** Safety of civil structure (1)

Being publicity funded Institution (Central Govt.), all Infrastructure/construction has to follow CPWD/VNIT. Norms and all buildings are supervised by qualified Engineers during construction. Before the buildings are accepted for use from the construction contractors all checks are done for stability of civil structure. Each structure is specifically certified by the Incharge Engineer from Estate Maintenance section after physical verification. The latest certificate is reproduced below:

VISVESVARAYA NATIONAL INSTITUTE OF TECHNOLOGY,  
NAGPUR  
PHYSICAL VERFICIATION CERTIFICATE  
TO WHOM SO EVER IT MAY CONCERN

This is to certify that the physical and structural verification of all buildings and connected ancillaries has been carried out during the year 2012-13 and found in order.

Date : 10/07/2013

sd/-

ENGINEER  
ESTATE MAINTENANCE SECTION  
V.N.I.T. NAGPUR

**8.7.4.** Handling of hazardous chemicals and such other activities (2) (Instruction: The institution may provide evidence that it is taking enough measures for the safety of the civil structures, fire, electrical installations, wiring, and safety of handling and disposal of hazardous substances. Moreover, the institution needs to show the effectiveness of the measures that it has developed to accomplish these tasks.)

## **8.8. Counselling and Emergency Medical Care and First aid (5)**

Availability of counselling facility (1)  
Arrangement for emergency medical care (2) Availability of first-aid unit (2)  
(Instruction: The institution needs to report the availability of the facilities discussed here.)

### **8.8.1 Medical Care:**

#### **Availability of medical care and emergency, first-aid facility:**

Institute through its health centre provides preventive, promotive & curative health services to the students, employees & their families. Resident doctor on campus & 24 x 7 availability of ambulance services take care of emergency needs.

Holistic health services available at health centre include family physician, counsellors, lady doctor, Paediatrician & dental services. Alternative health services like omeopathy & yoga are available. Referral for Ayurvedic services is available. hysiotherapy services promote fitness & address sports related problems.

Speciality Clinics for eyes & skin problems is available. Mental health services are provides though counsellors & Psychiatrist. Availability of dietician addresses menu planning for balanced diet in the mess besides giving dietary advice for modern epidemic of obesity, diabetes & cardiovascular problem. First aid facility is provided at all hostels.

### **8.8.2 Physical Education facilities:**

Sports and Games are essentials components of Human Resource Development, helping to promote good health, comradeship and spirit of healthy competition, which in turn, has positive and deep impact on the holistic development of the personality of the youth who is a potential source of energy, enthusiasm and inspiration for development, progress and prosperity of the nation.

The Institute aims at all round development of the students. This can be seen from the importance given to the Physical Education. Classes for Physical Education have been included in regular Time Table so as to ensure development of Physical Fitness of the students. Physical Education programs also include general health and safety information in addition to providing opportunities for students to learn how to cooperate with one another in a team setting.

### **Participation of students in different games**

The Institute encourages the students by exposing them to various Inter University Tournaments such as West Zone Inter University, All India Interuniversity, Inter-NIT tournaments and also in local inter-collegiate tournaments. The institute has won many championships in Football, Cricket, Badminton, Table Tennis, Chess, Volleyball and Kho-Kho events in All India Inter NIT Tournaments since 2009.

#### **Krik Mania:**

This is an Invitational Cricket Tournament being organized since last 20 years by the Institute students under the guidance of the Department of Physical Education at local level.

#### **Intramural and Krida Diwas:**

This is a unique program of event inter-section tournaments for different games conducted for first year B.Tech./B.Arch. students which goes round the year. The department celebrates the birth anniversary of the great Hockey legend Major Dhyanchand on 29<sup>th</sup> of August every year and on the same day the intramural program is also inaugurated.

#### **Medical examination:**

The Department of Physical Education coordinates for compulsory Medical Examination for all the first year B. Tech. /B. Arch. Students with our Medical Officer Dr. S. Batra. and his team.

#### **Physical Efficiency Test:**

Compulsory for every first year B. Tech./B.Arch. Components of physical fitness such as abdominal strength, respiratory endurance, flexibility of hip joint and hamstring muscles and speed are measured by applying suitable tests of fitness.

#### **Felicitation of the students:**

The department of Physical Education recognizes the efforts taken by first year students and felicitates them during the valedictory function of the intramural tournament.

### **Sports facilities currently available on the Campus**

- One Cricket Ground with six Turf wickets.
- One Football Ground with flood light arrangement.
- Two Volleyball Courts with flood light
- One Badminton Court.

- A Table Tennis Hall
- Three Lawn Tennis Courts.
- One Flood light Basketball Court.
- Well equipped Gymnasium
- Cricket pavilion with the seating capacity of 500 students

**Planned Sports Infrastructure in near future:**

Indoor Badminton Stadium with four Wooden sprung Surfaced Badminton courts, Table Tennis hall, Yoga hall, Class room, Sports Medicine Research Lab

## 9. Continuous Improvement (75)

This criterion essentially evaluates the improvement of the different indices that have already been discussed in earlier sections.

From 9.1 to 9.5 the assessment calculation can be done as follows

If a, b, c are improvements in percentage during three successive years, assessment can be calculated as

$$\text{Assessment} = (b-a) + (c-b) + (a + b + c) * (5/3)$$

### 9.1. Improvement in Success Index of Students (5)

From 4. 1

Items	LYG (c)	LYGm1 (b)	LYGm2 (a)	Assessment
Success Index	0.96	0.98	0.98	<b>5</b>

### 9.2. Improvement in Academic Performance Index of Students (5)

From 4. 2

Items	LYG (c)	LYGm1 (b)	LYGm2 (a)	Average of three years	Assessment
API	7.22	7.36	7.38	<b>7.32</b>	<b>5</b>

### 9.3. Improvement in Student - Teacher Ratio (5)

From 5. 1

Items	CAY (c)	CAY m1 (b)	CAY m2 (a)	Average of three years	Assessment
STR	33.45	34.44	27.79	<b>31.89</b>	<b>5</b>

### 9.4. Enhancement of Faculty Qualification Index (5)

From 5. 3

Items	CAY (c)	CAY m1 (b)	CAY m2 (a)	Average of three years	Assessment
FQI	8.78	9.11	9.23	<b>9.04</b>	<b>5</b>

### 9.5. Improvement in Faculty Research Publications, R&D Work and Consultancy Work (10)

From 5.7 and 5.9

Items	CAY (c)	CAY m1 (b)	CAY m2 (a)	Average of three years
FRC	10.55	14.44	10.48	<b>11.82</b>
FPPC	12.00	14.12	14.93	<b>13.68</b>

### 9.6. Continuing Education (10)

In this criterion, the institution needs to specify the contributory efforts made by the faculty members by developing the course/laboratory modules, conducting short-term courses/workshops, etc., for continuing education during the last three years.

Module description	Any other contributory institute / industry	Developed/organized	Duration	Resource persons	Target audience	Usage and citation etc.
Quality Assurance and Quality Control of Air Quality Monitoring	MPCB, Mumbai	Civil Engg. Deptt. VNIT, Nagpur	July 9-10, 2009	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
Planning and management of Urban Infrastructure	AICTE	Civil Engg. Deptt. VNIT, Nagpur	July 20-25, 2009	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives & Faculty	
Water Treatment Plant Design	CPHEEO, New Delhi	Civil Engg. Deptt. VNIT, Nagpur	Oct. 27 to Nov. 2, 2009	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
“Computer aided design of pipelines and pipe networks for water supply and sewerage systems”	CPHEEO, New Delhi	Civil Engg. Deptt. VNIT, Nagpur	November 12 – 18, 2009	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
“Environmental Engineering Systems Optimization”	CPHEEO, New Delhi	Civil Engg. Deptt. VNIT, Nagpur	Nov 23 – Dec 6, 2009	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
Quality Assurance and Quality Control in Water Quality Monitoring &	MPCB, Mumbai	Civil Engg. Deptt. VNIT, Nagpur	October 21 – 22, 2010	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	

Analysis (NWMP/SWMP)						
“Computer aided design of pipelines and pipe networks for water supply and sewerage systems”	CPHEEO, New Delhi	Civil Engg. Deptt. VNIT, Nagpur	November 18-24, 2010	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
Water Treatment Plant Design”	CPHEEO, New Delhi	Civil Engg. Deptt. VNIT, Nagpur	Jan. 7 to Jan. 13, 2011	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
Bio-Medical Waste Management	MPCB, Mumbai	Civil Engg. Deptt. VNIT, Nagpur	October 13 -14, 2011	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
Orientation Program on ‘Green Building Design Concepts & Application’	Nil	Civil Engg. Deptt. VNIT, Nagpur	16 <sup>th</sup> December 2011	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
Water Treatment Plant Design”	CPHEEO, New Delhi	Civil Engg. Deptt. VNIT, Nagpur	Jan. 6 to Jan. 12, 2012	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
“Computer aided design of pipelines and pipe networks for water supply and sewerage systems	CPHEEO, New Delhi	Civil Engg. Deptt. VNIT, Nagpur	November 17-23, 2012	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
Green Construction Project Management	Nil	Civil Engg. Deptt. VNIT, Nagpur	23-24 <sup>th</sup> June 2012	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
Water Treatment Plant Design”	CPHEEO, New Delhi	Civil Engg. Deptt. VNIT, Nagpur	Jan. 3, to 9, 2013	Faculty of Civil Engg. Deptt. VNIT, Nagpur	Industry & Government Organisation Executives	
“Water Quality	MPCB,	Civil Engg. Deptt.	Jan. 24 &	Faculty of	Industry &	



Issues”	Mumbai	VNIT, Nagpur	25, 2013	Civil Engg. Deptt. VNIT, Nagpur	Government Organisation Executives	
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Assessment =

### 9.7. New Facility Created (15)

Specify new facilities created during the last three years for strengthening the curriculum and/or meeting the POs:

- Facility Created in the area of Green Building Technology in the form of Built Environment Test Room Laboratory. This Facility was created by the support of our Institute and on-going DST Project.
- This Laboratory facility contains analytical equipments for building functional performance measurement (Temperature, Humidity, Light, CO<sub>2</sub>, Thermal conductivity of materials, energy audit kit, etc.) as well as software simulation facility (HevaComp-Bentley Product for lighting and thermal simulation).
- It is being used by PhD scholars as well as B Tech/ M Tech students for project work as well as assignments (Course- Energy Efficient Buildings)
- Two New Class Rooms of capacity 120 students and one Class Room of capacity 40 students were constructed over Water Resources Engineering Laboratory during the year 2011.
- Two New Class Rooms of capacity 120 students and three new staff rooms are under construction at main block of civil engineering department and likely to be completed in December 2013.
- New computer lab for UG & PG students of capacity 40 students was developed during the year 2013.
- LCD projectors were installed in all the class Rooms for teaching aid during the year 2012.
- All the laboratories were updated by procuring new instruments continuously during past three years and many new procurements are in pipeline.

### 9.8. Overall Improvements since last accreditation, if any, otherwise, since the commencement of the programme (20)

Specify the overall improvement:

Specify the strength / weakness	Improvement brought in	Contributed by	List of PO(s), which are strengthened	Comments, if any
CAY				
CAYm1				
CAYm2				

**Most of the strengths and weaknesses pointed out by NBA have been improved and corrected.**

### **Declaration**

The head of the institution needs to make a declaration as per the format given below:

This Self-Assessment Report (SAR) is prepared for the current academic year (2013-2014) and the current financial year (2013-2014) on behalf of the institution.

I certify that the information provided in this SAR is extracted from the records and to the best of my knowledge, is correct and complete.

I understand that any false statement/information of consequence may lead to rejection of the application for the accreditation for a period of two or more years. I also understand that the National Board of Accreditation (NBA) or its sub-committees will have the right to decide on the basis of the submitted SAR whether the institution should be considered for an accreditation visit.

If the information provided in the SAR is found to be wrong during the visit or subsequent to grant of accreditation, the NBA has right to withdraw the grant of accreditation and no accreditation will be allowed for a period of next two years or more and the fee will be forfeited.

I undertake that the institution shall co-operate the visiting accreditation team, shall provide all desired information during the visit and arrange for the meeting as required for accreditation as per the NBA's provision.

I undertake that, the institution is well aware about the provisions in the NBA's accreditation manual concerned for this application, rules, regulations and notifications in force as on date and the institute shall fully abide to them.

**Signature, Name, and Designation of  
the Head of the Institution with seal**

Place: Nagpur

Date:

**APPENDIX I**

**Pertaining to point 3.6. Course Syllabi (5)**

(Include, in appendix, a syllabus for each course used. Syllabi format should be consistent and shouldn't exceed two pages.)

The syllabi format may include:

- Department, course number, and title of course
- Designation as a required or elective course
- Pre-requisites
- Contact hours and type of course (lecture, tutorial, seminar, project etc.,)
- Course Assessment methods(both continuous and semester-end assessment)
- Course outcomes
- Topics covered
- Text books, and/or reference material

**CEL 201 – Soil Mechanics**

**Credit Hours:** 3 (Odd Semester)

**Contact:** 3 Hrs lectures 2 Hrs Practical per week,

**Instructor:** Dr. Anirban Mandal

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

*Required: Soil Mechanics & Foundation Engg.Auth- Punrnia B.C. Pub: Laxmi Publication Pvt. Ltd, New Delhi, 2005.*

*Supplemental Materials and Web Links: as provided at the course Blackboard site*

**Syllabus Description:** Introduction, Phases of soil and properties, Classification Permeability, Compaction, Consolidation of soil and Shear Strength of Soil.

**Prerequisites/Co-Requisites:** Engineering Mechanics

**Course Role in Curriculum:** Core/ Elective Course

**Course Objectives:**

1. Introduction of formation of soil.
2. Different soil Properties and co-relation.
3. Behavior of soil under external load.
4. Determination and physical understanding of soil parameters.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain a broad understanding of mechanics of soil
2. Get accustomed with the measurement of different soil parameters.
3. Shear strength and permeability of soil as suitable construction material.
4. Contemporary issues and developments.

**[Student Outcomes: a, b, e, j]**

**Course Topics:**

Formation of soil, residual & transported soils  
Various soil weight & volume inter-relationship  
Criteria of classification  
Discharge & seepage velocity, factors affecting permeability  
Stress distribution in soil mass  
Compression of laterally confined soil  
Mechanics of compaction factors affecting compaction  
Introduction to Shear Strength of Soil  
Practical

**CEL 202 – Hydraulic Engineering****Credit Hours:** 3 (Even Semester)**Contact:** 3 Hrs lectures per week,  
: 1 Hr Practical's Per Week,**Instructor:** Dr. Avinash Vasudeo**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars**Textbooks and Other Materials:***Required:**a. Garde R.J. and Mirajgaokar A.G Engineering Fluid Mechanics; Tata Scitech Publication, 2003.**b. Streeter V.L. and Wyle E.B, Mays W Larry; Fluid Mechanics; Tata McGraw-Hill New Delhi, 1998.**Supplemental Materials and Web Links: as provided at the course Blackboard site***Syllabus Description:**

Introduction to different state of matter and focus on fluids. Physical properties of fluids viz. density, specific weight, specific volume etc. Measurements of pressure and different devices used with special emphasis on manometers. Concepts of buoyancy and floatation. Hydrostatic force acting on bodies submerged in different positions under the fluid. Flow analysis using Flow net analysis. Pipe flows, various measurement instrumentation and various equations related to head loss. Introduction to open channel flow, instrumentation in data recording and various relations of economical channel depth. Introduction to pumps and fluid machinery.

**Prerequisites/Co-Requisites:.** N A.**Course Role in Curriculum:** Core/ Elective Course**Course Objectives:**

1. Introduce to Fluid state of matter.
2. Making students understand the importance of Fluid and its flow.
3. To make student explore the various equations and the concepts related fluid motion and equilibrium.
4. To make students understand the correlation between theory and practical by making them do practical's which are physical simulations of the theory such as Bernoulli's equation, venturimeter, orifices etc..

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Understand the relation between formulations and real site situations..

2. Application of equations in the design of fluid system.
3. Will develop analytical skills in handling variety of data.
4. Latest problematic issues and developments.

**[Student Outcomes: a, b, c, d, e]**

**Course Topics:**

Fluid Properties and measurement of pressure – manometers and gauges.

Hydrostatics- Total pressure and centre of pressure, pressure forces on vertical and inclined laminae, pressure on curved surfaces.

Buoyancy and floatation – Centre of buoyancy, body immersed in two different fluids, metacentre, metacentric height, stable, unstable and neutral equilibrium.

types of fluid flows and flow lines, Methods of describing fluid motion, Flownet, Fundamental equations of fluid flow, Venturimeter, Orifice and mouthpiece, Notches and weirs.

Elements of flow through pipes: Darcy Weisbach formula, Hydraulic Gradient Line, Total Energy Line, Minor losses, series and parallel connections.

Introduction to open channel flow: Manning's and Chezy's formula, Most economical section of channel, Uniform flow and Critical flow, Hydraulic jump elements.

Types of hydraulic turbines, Working principles of Centrifugal and Reciprocating pumps

**Practicals :**

Experiments on Ship model, triangular notch, rectangular notch, orifice, mouthpiece, manometers and pressure gauges, pitot tube, friction factor of pipeline, Chezy's and Manning's constant for a channel, venturimeter.

**CEL 203-Environmental Engineering I**

**Credit Hours:** 3 ( Even Semester) (3-0-2); **Credits 8**

**Contact:** 3 Hrs lectures per week,

**Instructor:** Dr. A. R. Tembhurkar

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

1. B.C. Punmia, Water Supply Engineering – Laxmi Publication
2. S.K. Garg, Environmental Engineering – Standard Publication
3. Metcalf, Eddy, "Wastewater Engineering"- McGraw Hill Publication.
4. M.J. Macghee, "Water Supply & Sewage – McGraw Hill Publication

**Syllabus Description:**

Importance and necessity of water supply scheme; planning of WSS; design period; population forecasting; water demand; sources of surface water, ground water, intake structure; conveyance of water, types of pipe joints and fitting; hydraulic design of pipes, rising main; pumps; water quality, standards of drinking water, Theory and application of water treatment unit operation and processes, aeration, coagulation, flocculation, sedimentation, filtration, disinfection; Selection of site and processes of water treatment, treatment flowsheet, Distribution system, appurtenances, detection and prevention of leakage, storage reservoir for treated water, Introduction to Solid Waste Management.

**Practicals:**

1. Determination of pH
2. Determination of conductivity
3. Determination of chlorides
4. Determination of solids

5. Determination of turbidity
6. Determination of Acidity & alkalinity
7. Determination of dissolved oxygen
8. Determination of hardness
9. Determination of available chlorine
10. Jar test
11. Bacteriological plate count and MPN
12. Demonstration of COD, BOD

**Prerequisites/Co-Requisites:** .....

**Course Role in Curriculum:** Core Course

**Course Objectives:**

1. To learn the fundamentals of Water Engineering
2. To understand various components of water supply scheme
3. To build skills to quantitative and qualitative assessment of water requirement
4. To understand how to solve water treatment unit design problems using hydraulic principles and methods
5. To understand operation of water treatment units.
6. To provide broad knowledge of solid waste management systems.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Understand the water supply scheme and be able to estimate quantities and quality of water for municipal use
2. Understand the types of processes used to treat water for municipal purpose
3. Understand how processes are configured in treatment systems.
4. Understand the fundamental engineering and science principles that are used to design and operate the processes used in treatment systems.
5. Learn how to use laboratory procedures and measurements to determine qualitative parameter of water and wastewater.
6. Understand basics of solid waste management.

[Student Outcomes: a, b, c, e, j, k]

**CEL 204 – Building Materials and Technology**

**Credit Hours:** 3 ( Odd Semester)

**Contact:** 3 Hrs lectures per week,

**Instructor:** Dr. Shilpa Dongre

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

*Required:* 1. Building Construction by B. C. Punmia, A. K. Jain and A. K. Jain, 10th Edn., Laxmi Publications (P) Ltd.

2. Building Construction by Sushil Kumar, Standard Publishers Dist.

*Supplemental Materials and Web Links:* as provided at the course Blackboard site

**Syllabus Description:** Introduction to building components, functions of each component in building, materials of construction and techniques of construction for

each component. Detailed study of various components such as foundations, masonry work, floors, roofs, stairs, doors and windows, arches and lintels etc. Importance and methods of damp proofing, plastering, painting etc.

**Prerequisites/Co-Requisites:** Nil

**Course Role in Curriculum:** Core

**Course Objectives:**

1. Introduce to building components.
2. Introduce to various materials of construction, understand their properties and their testing procedures.
3. Teach principles and methods of construction for each component.
4. Teach fundamentals of design for each component.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Understand the importance and role of each component in building,
2. Apply basic fundamentals of design and construction for any building,
3. Select construction materials under different site conditions by understanding the basic properties of materials,
4. Supervise the construction work of buildings,

**[Student Outcomes: a, b, c, k]**

**Course Topics:**

Introduction to all components of building from foundation to finishing work and includes the following.

Foundations - necessity and types, their selection, soil properties;

Brickwork – manufacturing, classification, various bonds and construction principles;

Stonework – common stones in India, their selection, types of stone masonry and their

construction;

Arches and Lintels – types and construction;

Damp-proofing – causes, damp proofing materials and methods of damp proofing;

Floors and Roofs – types, and construction methods;

Stairs – introduction, types and their functional design

Doors and Windows – types and salient features of construction;

Plastering and Pointing – types of mortars and their selection, method of plastering, finishes;

Temporary timbering – Centering and formwork, shoring, scaffolding, underpinning;

Painting - white washing, colour washing and distempering, new materials & techniques; Introduction to principles of acoustics (sound insulation), earthquake resistant structures.

**CEL 205 – Building Design and Drawing**

**Credit Hours:** 2 (Even Semester)

**Contact:** 2 Hrs lectures per week,

**Instructor:** Dr. Shilpa Dongre

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

*Required:* 1. Building drawing by Shah, Kale and Patki, 4th Edn., TMH Publ.  
2. A course in Civil Engineering drawing by V. B. Sikka, S. K. Kataria and Sons.

*Supplemental Materials and Web Links:* 1. IS: 1256-1958 (IS Code of building byelaws)  
2. As provided at the course Blackboard site

**Syllabus Description:** Fundamentals of civil engineering drawing, its importance. Development of working and submission drawings for residential buildings. Study of building bye-laws. Planning of buildings (residential and public both) as per bye-laws and principles of planning. Development of two-point perspective views for buildings.

**Prerequisites/Co-Requisites:** CEL 204- Building materials and technology

**Course Role in Curriculum:** Core

**Course Objectives:**

1. Introduce to building drawing, scales, lines, abbreviations used in drawing,
2. Teach development of working and submission drawings from a given plan,
3. Teach fundamentals of planning of buildings as per local building bye-laws and planning principles,
4. Introduce to perspective drawings and teach development of two-point perspectives for buildings

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain a broad understanding of planning and designing of buildings
2. Develop working and submission drawings for any building
3. Know the procedures of submission of drawings and getting sanctions for a project
4. Plan and design a residential or public building as per the given requirements
5. Develop the perspective views for any building.

**[Student Outcomes: a, b, c, g, k]**

**Course Topics:**

Importance of Building drawing,

Drawing guidelines as per IS: 962, 1967

Developing working drawing from the given sketch, both for single and multi storied buildings

Developing submission drawings to scale with location plan, site plan and block plan  
Study of building bye-laws and principals of planning,

Planning of residential and public buildings, recommendations of CBRI, Roorkee.

Graph paper drawing (line plans) based on various requirements for residential, public, educational, industrial buildings including interior aspects as well.

Two point perspective of residential buildings

**AML 262 – Strength of Materials**



**Credit Hours:** 3 ( Odd Semester)

**Contact:** 3 Hrs lectures per week,

**Instructor:** Mr. A Y Vyavahare

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

1. Beer FP, Johnston ER, Dewolf JT and Mazurek DF, 'Mechanics of Materials', Fifth Edition in SI units, Special Indian Edition-2009.
2. Hibbler R.C., Mechanics of Materials, Pearson Education, Asia Pvt Ltd.
3. Popov, E R., Engineering Mechanics of Solid, Prentice Hill of India, New Delhi, 2000.
4. Singer, F. L., Strength of Materials, Harper Collins Publishers, Singapore, 1987.
5. Stephen Timoshenko, Strength of Materials, CBS Publishers and Distributors, New Delhi.

**Syllabus Description:**

Mechanical Properties of material, Axial Force, Shear Force and Bending Moment in a beam, Torsion in circular shaft, Stresses in Beams, Combined Bending Moment and Axial Force, Transformation of stresses, Membrane Stresses, Deflection of Beams, buckling of Columns and Struts, Theories of failure.

**Prerequisites/Co-Requisites:** NIL

**Course Role in Curriculum:** Core

**Course Objectives:**

1. Introduce to mechanical properties of materials,
2. Determination of internal forces in member,
3. Determination of stresses in cross section of member.
4. Theories of failure of brittle and ductile materials.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain a broad understanding of behavior of materials,
2. Identify forces to be resisted by member,
3. Analyze stresses in member,
4. Determine deformations of simple members,

[Student Outcomes: a, b, e, j]

**Course Topics:**

Mechanical Properties

Axial Force, Shear Force and Bending Moment diagrams

Torsion of circular shaft

Stresses in Beams

Combined Bending Moment and Axial Force

Transformation of stresses

Stresses in thin-walled cylindrical and spherical pressured vessels

Slope and deflection of Beams

Buckling of Columns and Struts  
Introduction to Theories of failure

**CEL 206 - Engineering Geology**

**Credits : 8** (Even Semester)

**Contact : 3 Hrs** lectures per week, **2Hrs** Practical's per week

**Instructor : Dr. Y. B. Katpatal**

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials :**

*Required : Principles of Engineering Geology*, Edition 2005, KVGK Gokhale, B S Publications.

Textbook of Engineering Geology, N. Chenna Kesavulu, McMillan India Publications

*Supplemental Material :* A Geology for Engineers, Edition 2006, F.G. H. Blyth, M.H. de Freitas, Butterworth- Heinemann (Elsevier).

**Syllabus Description :** Introduction to Earth System approach, Material, Global processes operating on Earth, Geodynamics, Earthquake generation and zones, Groundwater storage zones and aquifer characteristics, Stratigraphy, Structural deformations within the earth, Geophysical exploration methods, Rock mass properties as construction material and site, Considerations for engineering projects.

**Prerequisites:** None

**Course Role in Curriculum :** Core

**Course Objectives :**

1. To Understand the Earth System
2. Teach fundamental geomorphic and dynamic processes on the Earth
3. To know about the material present i.e. minerals and rocks
4. understand Structural deformations and impacts
5. Earthquakes and causes, effects, zones
6. Know subsurface exploration methods
7. Know groundwater availability and domains; recharge
8. Teach consideration for site selection for projects.

**Course Outcomes :** At the completion of this course, the student will be able to

1. Generate global vision of Earth processes
2. Identify the subsurface material
3. Knows reason of phenomena like Earthquakes and zoning
4. Know about groundwater availability zones and groundwater management
5. Know megascopic and mechanical properties of rocks
6. Know field procedures of subsurface exploration
7. Generate subsurface profiles and map structures
8. Know considerations for site selection for engineering projects

[ **Student Outcomes : a, b, d, e, h** ]

**Course Topics :**

Scope of Engineering Geology,  
Internal structure of the earth.

Continental drift and Plate Tectonics; Isostasy and diastrophism.  
 Mineralogy, Chemical and physical characters of Mineral Groups.  
 Formation and classification of Igneous, sedimentary and metamorphic rocks  
 Textures, structures/ forms of Igneous, sedimentary and metamorphic rocks  
 Structural deformations in rocks,  
 Mechanism of formation, nomenclature classification and field identification of Folds, Joints, Faults.  
 Problems on Strike, Dip, thickness and depth of strata.  
 Geomorphology: Definition & Scope; Basic concepts; internal and external processes;  
 Geomorphological classification, weathering and erosion  
 Stratigraphy: Definition, scope & principles of Stratigraphy,  
 Physiographic and tectonic divisions of India  
 Review of Indian Stratigraphy.  
 Geomechanical properties and Classification of rocks and basement characteristics; Rock as construction material, road metal etc.  
 Surface and subsurface investigations;  
 Geophysical and remote sensing studies;  
 Site investigations for design & construction of Dams, Bridges, Tunnels, buildings.  
 Engineering Seismology: Causes and effects of earthquakes;  
 Seismic waves, magnitude, intensity of earthquakes  
 Seismic zoning & seismic Zones of India; aseismic structures.  
 Geohydrology: Occurrence, availability & movement of Groundwater;  
 Rocks as aquifers, Groundwater investigations, groundwater development and management;  
 Techniques of groundwater recharge.  
 Stability of Slopes & Landslides: Causes and prevention  
 Environmental aspects of Geology.

**CEL 207 – Surveying I**

**Credit Hours:** 3 (Odd Semester)

**Contact:** 3 Hrs lectures and 2 Hrs Practical per week

**Instructor:** Dr. Anirban Mandal

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

*Required: Surveying-I. Auth- Punmia B.C. Pub: Standard Book-House, Latest Edt. New Delhi,. Supplemental Materials and Web Links: as provided at the course Blackboard site*

**Syllabus Description:** Linear Measurement, Compass Surveying, Plane Table Surveying, Tacheometric Surveying, Leveling and Theodolite.

**Prerequisites/Co-Requisites:** Nil

**Course Role in Curriculum:** Core/ Elective Course

**Course Objectives:**

1. Principal and rule of Surveying.
2. Different Surveying method and related Instrument.
3. Use of field book for different Survey.
4. Use of with different survey equipments.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain a broad understanding of Land Survey
2. Get accustomed with the angular and linear measurements.
3. Trained with recording the field information and necessary plot.
4. Contemporary issues and developments.

**[Student Outcomes: a, b, e, j]**

**Course Topics:**

Definition - Principles - Classification - Field and office work

Prismatic compass - Surveyor's compass - Bearing

Plane table instruments and accessories

Level line - Horizontal line-Methods

Study of Theodolite – Temporary and permanent adjustments

Compression of laterally confined soil

Theory, Instrument Constants, Methods

Field Work

**CEL 301 – Foundation Engineering**

**Credits : 6** (Even Semester)

**Contact : 3 Hrs**, lectures per week-3

**Instructor : D. J Katyayan**

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials :**

*Required :*

Soil Mechanics in Theory & Practice- Alam Singh, Asia Publishing House, 1975 & later

Geotechnical Engineering - S. K. Gulhati & Manoj Dutta, Tata McGraw Hill, 2005

Soil Mechanics & Foundation Engg.- Punmia B.C., Laxmi Publication Pvt. Ltd, New Delhi,1994

*Supplemental Material :*

Foundation Manual- N. V. Nayak

Soil Mechanics & Foundation Engg.- Arora K.R

**Syllabus Description :** Expanse of syllabus covers choice of shear parameters, analysis of slopes, assessment of earth pressures. Analysis and design of different foundations is second component. Thirdly methods planning & conducting Geotechnical Exploration program for various projects is another component. An insight of Ground Improvement techniques also forms part of syllabus.

**Prerequisites:** CEL 201- Soil Mechanics

**Course Role in Curriculum :** Core Course

**Course Objectives :**

1. Decision of choosing appropriate shear parameters for stability of slopes, assessment of earth pressures, foundation design & analysis.
2. Methods of stability analysis of slopes.
3. Various earth pressure theories

- 4.Design & analysis of shallow foundations
- 5.Deciding dimensions of piles & their load carrying capacity
- 6.Learn methods & process of Geotechnical Exploration
- 7.Introduction to Ground Improvement techniques.

**Course Outcomes :** At the completion of this course, the student will be able to

- 1.Choose appropriate shear parameters in various applications
- 2.Analyse stability of slopes
- 3.Decide exerted earth pressures on different structures.
- 4.Determine & decide bearing capacity of soils
- 5.Design pile foundations
- 6.Conduct & plan Geotechnical Exploration program.
- 7.Have an insight of Ground Improvement technique that could be adopted.

[ **Student Outcomes : a, b, c, e**]

**Course Topics :**

Shear Strength of Cohesionless & Cohesive soils( revision),  
 Stability of Slopes  
 Earth Pressure Theories  
 Bearing capacity & settlement analysis of foundations  
 Pile Foundations,  
 Geotechnical Exploration,  
 Ground Improvement.

**CEL 302 – Transportation Engineering**

**Credits:** 8 (Odd Semester)

**Contact:** 3 Hrs lectures and 02 Hours Practical per week

**Instructor:** Dr. Anjan Patel

**Textbooks and Other Materials:**

*Required:*

- Highway Engineering, S.K.Khanna & C.E.G Jesto, Nemi Chand Brithers Roorkee.
- Traffic Engineering and transportation Planning, Dr. K. R. Kadiyali, 7<sup>th</sup> Edition, Khanna Publisher
- Bridge Engineering, S.P. Bindra, Dhanpat Rai Publishers
- Transportation Engineering & Planning, C.S Papacostas & P.D. Prevedouros, 3<sup>rd</sup> Edition, John Willey & Sons.
- Traffic and Highway Engineering, 4th Ed., N. Garber and L. Hoel, Brooks/Cole, 2009.
- *Supplemental Materials and Web Links:* as provided at the course Blackboard site. Related IRC Codes for Highway & Bridge Design.

**Syllabus Description:** Fundamentals of Transportation System, Development & Planning, Traffic Engineering, Pavement Materials, Geometric Design of Pavements, Design of Flexible and Rigid Pavements and Bridge Engineering.

**Prerequisites/Co-Requisites:**

**Course Role in Curriculum:** Core

**Course Objectives:**

1. Introduce to transportation and traffic engineering.

2. Introduction to transportation planning.
3. Teach geometric design of highways.
4. Teach design of flexible and rigid pavements
5. To teach various laboratory testings for characterization of pavement materials
6. Introduction to bridge engineering

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain a broad understanding of transportation engineering
2. Transportation systems and organizations
3. Driver, vehicle, pedestrian, road and traffic characteristics.
4. Basic understanding of various bridge design parameters
5. Ability to characterize pavement materials
6. Contemporary issues and developments.

[Student Outcomes: a, b, c, e, j]

**Course Topics:**

Introduction to transportation modes and fieldwork

Transportation Planning

Traffic characteristics & control systems

Traffic speed studies, traffic flow and density

Parking Studies

Geometric design standards

Design of vertical and horizontal alignments

Design of flexible and rigid pavements

Pavement materials and its properties

Bridge engineering

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**CEL 303 – Environmental Engineering – II**

**Credit Hours:** 3 (Odd Semester)

**Contact:** 3 Hrs lectures per week,

**Instructor:** Dr. Dilip H. Lataye

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

*Required*

1. Punmia B.C.; Waste Water Engineering; Laxmi Publication, 2002
2. S.K. Garg; Environmental Engineering; Vol II Standard Publication, 2002
3. Metcalf, Eddy; Wastewater Engineering; McGraw Hill Publication, 2004
4. Macghee M.J.; Water Supply & Sewage; McGraw Hill Publication, 1990
5. Rao M.N.& Rao H.V.N.; Air Pollution; McGraw Hill Publication, 1992
6. Rao C.S.; Environmental Pollution Control Engineering; 1990

*Supplemental Materials and Web Links:*

1. Howard S. Peavy, Donald R. Rowe and George Tchobanoglous; Environmental Engineering; McGraw - Hill International Editions, Civil Engineering Series, Singapore

2. Mackenzie L. Davis and David A Cornwell; Introduction to Environmental Engineering; Tata McGraw Hill Education Private Limited, New Delhi
3. Gerard Kiely; Environmental Engineering; Tata McGraw-Hill Publishing Company Limited, New Delhi
4. Arcadio P. Sincero and Gregoria A. Sincero; Environmental Engineering A Design Approach; Prentice-Hall of India Private Limited, New Delhi.

**Syllabus Description:** Aspects of Wastewater Engineering, Wastewater management, Collection and conveyance of wastewater, Wastewater Characteristics, Treatment and Disposal of Wastewater, Introduction to air pollution: sources, effects on human, plants, animals and materials, control of air pollutants.

**Prerequisites/Co-Requisites:** Environmental Engineering-I

**Course Role in Curriculum:** Core

**Course Objectives:**

1. Introduce wastewater engineering.
2. Teach design of sewer and various wastewater treatment units.
3. Introduce air pollution.
4. Teach control of air pollution

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain a broad understanding of wastewater engineering
2. Wastewater management systems and design of various treatment units
3. Understand about the disposal of wastewater.
4. Contemporary issues and developments.

**[Student Outcome: a, b, d, e, k]**

**Course Topics:**

General Aspects of Wastewater Engineering; System of collection and conveyance of sewage – separate and combined systems; Patterns of sewage collection systems; Quantity of sewage and storm water;

Sewer: Types, Shapes, Hydraulic Design (Capacity, Size, Grade, etc.); Construction of sewer – Shoring Trenching and Laying to grade. Sewer materials; Sewer Appurtenances – Manhole, Street Inlets, Storm water overflows, Inverted Syphons, Flushing and Ventilation. House plumbing systems – sanitary fitting and appliances, traps, anti-syphonage, inspection chambers and intercepting traps; Sewage pumping – location of pumping station and types of pumps. Sewer testing and maintenance.

Characteristics of wastewater; Sewage treatment flow sheet; Site selection for sewage treatment plant. Preliminary and primary treatment – Screens, Grit chambers, Primary settling tank (including simple design).

Secondary treatment – Principle of Biological Treatment Activated sludge process, trickling filter; Methods of disposal – disposal on land and in water stream, Sewage farming, Self purification of stream. Sludge digestion, Sludge drying beds. Rural sanitation – Pit privy, aqua privy; Bio-gas recovery; Septic tank including soak pit, (including design problem); Sullage collection and disposal.

Industrial Waste Water Treatment – Significance of Industrial Waste Water Treatment, important physical and chemical parameters, unit operations and treatment processes (flow equalization, neutralization, adsorption, chemical and biological treatment etc.).

Introduction to air pollution; Sources of air pollution and its classification ill – effects of air pollutants on man, animal & materials Meteorological parameters Methods of air pollution control.

**CEL 304 – Concrete Engineering ( 3-0-2)**

**Credit Hours:** 8 (Odd Semester)

**Contact:** 3 Hrs lectures per week + 2 hrs of Practical

**Instructor:** Dr. A.D.Pofale

**Prerequisites/Co-Requisites:** AML-262-Strength of Materials.

**Course Role in Curriculum:** Core Course

**Textbooks and Other Materials:**

1. Gambhir M.L, Concrete Technology, Tata McGraw Hill, Second, 1995.
2. Shah M.G., Kale.C.M. RCC Theory and Design. Macmillan India Ltd. 1987.
3. N. Krishnaraju; Prestressed Concrete, Tata McGraw Hill, (Third Edition) 198.
4. M.S.Shetty, Concrete Technology, S.Chand & Company New Delhi, 2005.
5. Orchard D.F., Concrete Technology -Vol I., Applied Science Publishers (Fourth Edition) 1979.
6. Neville A.M&J.J.Brook; Properties of Concrete, Addison Wesley 1999.
7. Lin T.Y,BurnsN.H.; Design of prestressed concrete structures. John Wiley & sons. (Third Edition).1982.
8. S. Ramamurtham Reinforced Concrete Design Dhanpat Rai Publications 2009.

**Course Topics:**

1. Types, function, classification, properties, and Tests on Portland cement:, Aggregates & water .
2. Production of concrete including tests on fresh & hardened concrete: compacting and curing of Concrete , Purpose , use and types Admixtures; Concept of durability Types of concrete
3. Concrete mix design and methods of mix design
4. Concepts of Prestressed concrete: Materials, properties, methods, systems advantages and disadvantages, Analysis & design of prestress concrete sections. Working stress method of design of one way slab, beams, column & footings.

**Course Objectives:**

7. To Emphasis upon importance of concrete as versatile construction material & its suitability & adaptability in concrete construction
8. To study knowledge of Concrete making materials & ingredients &. Various parameters affecting properties of concrete including concrete mix proportioning.
9. To provide need based Knowledge of methods to obtain various types of concretes.
10. Conceptual understanding of Reinforced cement concrete & Properties and design of structural elements like slab, beam column and footings as per Indian standard codes..
11. To study the concept of prestressed concrete its properties & to impart knowledge about its mechanized design & methods in light of modern construction.



12. To analyze & design various prestressed concrete structural elements per Indian standard specification.

**Course outcome**

1. Achievement of basic knowledge on Concrete Technology, Concrete production, its type & applications in field of construction.
2. Achievement of Conceptual understanding of what is Engineered concrete?
3. Achievement of Knowledge of prestressed concrete ,its requirement in construction , application & design
4. Acquired basic knowledge of design of elementary RCC elements like one way slab, beams, column & footings.

**[Student Outcome: a, b, c, d, e, k]**

**Syllabus Description:**

Portland cement: Types and properties, Tests on Portland cements, Aggregates: classification function, and types. Properties and Tests on aggregates. Water: its quality and recommendations. Production of concrete: mixing, casting, compacting and curing of Concrete, workability concept, tests, workability factors, Admixtures: Purpose, use and Types

Hardened concrete: Tests on concrete, properties and factors affecting properties of concrete,, Non destructive tests on concrete, Concrete mix design and methods of mix design Concepts of durability, Types of concrete

Concepts of Prestressed concrete: Materials, their properties, advantage and disadvantages, methods of prestressing & prestressing systems, Losses in prestress, Design of R. C.C. and Prestressed Concrete (W.S.M)

Reinforced concrete: Design concept, I.S.456-2000 for working stress method, Working stress method: Flexural behaviour of beam under load, Analysis and design of singly reinforced, doubly reinforced rectangular beam sections and “T” and “L” beam sections, Shear and bond stress.

Design of simply supported and cantilever beams, Lintels, one-way slab, and cantilever canopy. Design of axially loaded columns and axially loaded isolated footing.

Prestressed concrete: Analysis by Homogeneous beam concept, load-balancing concept, pressure Line. Design of simple rectangular sections like slab and beam .

**Practicals :**

- 1) Tests on properties of cement: Standard consistency, Initial and final setting time, Fineness soundness and compressive strength of cement.
- 2) Tests on aggregates: Sieve analysis, grading, Fineness modulus, Bulk density and specific gravity of coarse and fine aggregate. Deleterious materials, Silt content and Bulking of sand.
- 3) Measurement of workability of concrete. Slump, compaction factor/ Vee Bee Test
- 4) Concrete mix Proportioning
- 5) Casting, curing and testing of concrete for compressive strength.
- 6) Nondestructive testing of concrete
- 7) Study experiment on prestressed concrete.

**Following listed RCC designs with drawings on A4 size sheet.**

Design of slab: One way simply supported and cantilever slab

Design of beams, Lintels, T and L Beams.

Design of. Axially loaded Column with pad/sloped rectangular footing

**CEL 305 – Design of RCC Structure ( 3-0-0)**

**Credit Hours:** 6 ( Odd Semester)

**Contact:** 3 Hrslectures per week

**Instructor:** Dr. A.D.Pofale

**Prerequisites Co-Requisites/: CEL 304 – Concrete Engineering ( 3-0-2)**

**: Course Role in Curriculum:** Core Course

**Textbooks and Other Materials:**

- 1.Varghese P.C.; Limit state design of Reinforced Concrete Structures Prentice Hall of India, 1999.
- 2.Karve S.R. & Shah V.L, Limit State Theory and Design of Reinforced Concrete, Structures Publications, Pune. 2007.
- 3.S.U.Pillai ,D.Menon: Reinforced Concrete Design, Tata Mcgraw-Hill Publishing Company New Delhi 2003.
- 4.Ramchandra. Limit state Design Standard Book House 1990. Bureau of Indian Standards, I.S.456-2000: Plain and reinforced concrete, Code of Practice, Bureau of Indian Standards 2000.
- 5.I.S.3370-1967: Part I, II and Part IV, Code of Practice for Concrete structures for storage of liquids. Bureau of Indian Standards 1967.
- 6.S.P. (16): Design Aids for Reinforced Concrete. (Interaction Charts Only) Bureau of Indian Standards 1980.

**Course Topics:**

- 1.Limit state Design Concept; Use of I.S. 456-2000, Limit state of collapse in flexure : Design of one way single span slab and continuous slabs, canopies and two way & Analysis and Design of Singly and Doubly reinforced Beams, “T” and “L” beams.
2. Limit State of collapse in shear, Bond and Torsion, Interaction between Bending moment, Torsional moment and Shear.
- 3.Limit state of serviceability: Deflection and moment curvature relationship, for beams and one-way slabs.
- 4.Limit state of collapse under compression: column with axial load, uniaxial and biaxial moment, Interaction diagram / Charts.
- 5.Isolated footing for axially loaded columns, Uniaxial bending;, combined footing: Rectangular footing, Strap beam, Trapezoidal, raft etc.
- 6.Cantilever & Counterfort Retaining Walls.
- 7.Analysis and design of portal frames (single bay single storey) hinged or fixed at base.
- 8.Design of Dog legged and Open Well Staircase.
- 9.Design of Circular and Rectangular water tank (Working Stress Method).resting on ground by approximate method.

**Course Objectives:**

- 9.To understand the philosophy of design of RCC structural elements by working stress method ,ultimate load theory & limit state design method.
10. To study the Limit state Design Concept ,risk of failure & various limit states of collapse, including Load factors & partial safety factors.
11. To design one way single span slabs and continuous slabs, canopies and two way slabs.
12. To provide knowledge of short term, long term deflections of slab, beams.
13. To analyze and Design of Singly and Doubly reinforced Beams, “T” and “L” beams.

14. To study Limit State of collapse in shear, Bond and Torsion, & design for Interaction between Bending moment, Torsion moment and Shear.
15. To study & design Limit state of collapse under compression: Axially loaded short and long column, with axial load, uniaxial and biaxial moment, Interaction diagram / Charts.
16. To study & design isolated footing for axially loaded columns, Uniaxial bending, combined footing: Rectangular footing, Strap beam, Trapezoidal, raft etc.
17. To study & design Cantilever & Counterfort Retaining Walls. Dog legged and Open Well Staircase, Circular and Rectangular water tank with roof slab / dome resting on ground

**Course Outcome:**

**On the basis acquired knowledge, the learner is able**

- 1.To understand conceptually the difference between Working stress method, Ultimate load theory method & Limit state Design method.
- 2.To design the structural elements like RCC beam, slab, column, and footings by limit state Design method as per I.S.456-2000.
- 3.To design two way slab & one way continuous slabs
- 4.To design columns & footings for eccentric loads.
- 5.To design RCC Retaining walls & design of water tanks.

**[Student Outcome: a, b, c, d, e, k]**

**Syllabus Description:**

Limit state Design Concept; Partial safety factors, load factors, stress-strain relationship, stress block parameters, failure criteria, Use of I.S. 456-2000, Limit state of collapse in flexure : Design of one way single span and continuous slabs, canopies and two way slabs with various end conditions using IS code coefficients. Analysis and Design of Singly and Doubly reinforced Beams, “T” and “L” beams.

Moment redistribution: Analysis and design of fixed beams, propped cantilever, two span symmetric continuous beams. Limit State of collapse in shear, Bond and Torsion, Design for Interaction between Bending moment, Torsional moment and Shear. Limit state of serviceability: Deflection and moment curvature relationship, for beams and one-way slabs.

Limit state of collapse under compression: Axially loaded short and long column, column with axial load, uniaxial and biaxial moment, Interaction diagram / Charts. Isolated footing for axially loaded columns, Uniaxial bending, combined footing: Rectangular footing, Strap beam, Trapezoidal, raft etc.

Analysis and design of portal frames (single bay single storey) hinged or fixed at base. Design of Cantilever & Counterfort Retaining Walls. Design of Dog legged and Open Well Staircase.

Design of Circular and Rectangular water tank with roof slab / dome resting on ground by approximate method. (Using Working Stress Method).

**AML 361-Structural Analysis**  
**Credit Hours (3-0-0); (Odd Semester)**  
**Contact: 3 hours per week**  
**Instructor: Dr. M.M.Mahajan**

**Textbooks and Reference Books:**

1. Timoshenko S. P.; & Young D.H. "Theory of Structures; International edition", McGraw Hill, 1965.
2. Ghali, A.; & Neville A. M. "Structural Analysis A Unified Classical and Matrix Approach (4th Edition)", E & FN SPON; Van Nostrand Reinhold, 1997.
3. Wang, C. K. "Indeterminate Structures", Prentice Hall of India; 2000.
4. Schodek, D.L. "Structures (4th Edition)", McGraw Hill International editions; 1983.
5. Meghre, A.S.; & Deshmukh, S.K. "Matrix Methods of Structural Analysis (1st Edition)", Anand; Charotar Publs, 2003.
6. Weaver J.M.; & Gere, W. "Matrix Analysis of Framed Structures (3rd edition)", Van Nostrand Reinhold; New York, 1990.
7. Rajsekaran S., Shankarasubramanian "Computational Mechanics", Prentice Hall of India Pvt Ltd New Delhi 2001

**Syllabus Description: Analysis of** Different types of determinant and in-determinant structure by various methods. To have understanding of Influence Lines and Rolling Load

**Prerequisites/Co-Requisites:.....**

**Course Role in Curriculum: Core Course**

**Course Objectives:**

5. Introduce static and kinematic indeterminacy
6. Teach equilibrium based methods of analysis for determinant and in-determinant structures
7. Concept of Strain Energy
8. To develop the ability to get design parameters such as maximum Bending Moment and maximum Shear Forces etc for determinant and in-determinant structures

**Course Outcomes:**

At the completion of this course, the student should be able to

- 6. Able to analysis determinant and in-determinant structures**
- 7. Able to understand Structural Responses**
- 8. Able to analyse Field problems of Structural analysis**
- 9. Disseminate knowledge of structural Analysis to society.**
- 10. Communicate effectively the design parameters to the stakeholders.**

**[Student outcome: a,b,c,e,g and k]**

Moment Area Method, Conjugate Beam Method, Analysis of fixed and continuous beams by theorem of three moments, effect of sinking of support.  
Analysis of continuous beams and simple (non-sway) portal frames using Moment

**Distribution Method.**

Rolling loads (including IRC) on simply supported beams with concentrated and uniformly distributed loads, maximum B.M. and S.F., Influence lines for reactions, bending moments and shear forces in simply supported beams, cantilevers and beams with overhangs, Influence lines for forces in members of simple trusses. Strain energy method as applied to the analysis of redundant frames and redundant trusses up to two degrees.

Determination of deflection of trusses, Williot-Mohr diagram, Castigliano's theorem, Maxwell's reciprocal theorem, Betti's theorem

Buckling of Column and beam-column, Euler's and Rankine's formula, Analysis of Two-Hinged arches, S.F. and normal thrust, parabolic arches.

Slope deflection method as applied to indeterminate beams & continuous beams, portal frames.

**Name of Programme:** B Tech (Civil Engineering )

**Course Name:** AML 363 Design of Steel Structures

**Offered in:** Semester VI

**Scheme and Credit:** (3-0-0); Credits: 6

**Type of Course:** Core

**Course Objectives:**

- A.** To introduce the limit state method for design of steel structures with loading standards as per codal provision.
- B.** Introduction of structural forms/section with their properties.
- C.** To qualify the students for elementary design of tension/compression members, truss.
- D.** To disseminate the knowledge for design of beams, column with base plates and plate girder.
- E.** To qualify the students to understand the behavior of bolted and welded connection.
- F.** Introduction of connections design for various structural members.

**Syllabus:**

Steel as a structural material, various grades of structural steel, properties, various rolled steel sections (including cold formed sections, structural pipe (tube) sections) and their properties. Introduction to I.S. 800, 808, 816, 875, 1893 etc.; Design of axially loaded members: (a) Tension members (b) Compression members

Design of roof truss: Load assessment for DL, LL and WL

Design of simple and built up beams: Laterally restrained and unrestrained, (symmetrical as well as unsymmetrical section). Curtailment of flange plates. Design of welded plate girder, concept of gantry girder.

Design of single rolled steel section column subjected to axial load and biaxial moment including base design.

Design of axially loaded built up columns. Laced and battened (Column bases slab base gusseted base moment resistant bases)

Structural Fasteners: a) Behavior of bolted and welded connections (types, Designations,

properties, permissible stresses), failure of bolted and welded joints. Strength of bolt and strength of weld. Efficiency of joints. Design of simple bolted and welded connections. (b) Moment resistant bolted and welded connection (bending and torsion);  
Design of connection: Beam to beam, beam to column: framed connection. Seismic coefficient method [IS1893 (part I): 2002, seismic design and detailing of steel structures.

**Reference Books/Material:**

1. N. Subramanian, "Steel structure design practice", Oxford university press-2010.
- 2 "Steel Design Manual", ELBS and Granada Publishers, London, 1990.
- 3 V. L. Shah & Gore, "Limit state design of steel structures", structural publications 2010.
- 4 Arya, A. S. & Ajmani, J. L., "Design of steel structures", Nemchand & Bros., Roorkee, 1982.
- 5 Gaylords, E. H. & Gaylords, C. N., "Design of steel structures", McGraw Hill Publ, 1998.

**Course Outcomes:**

- i. Capable of using all loading and limit state design methods for steel structures.
- ii. Capable of elementary design of tension /compression member.
- iii. Able to provide the design of beams, column base plates, plate girder.
- iv. Capable of understanding the types of structural fasteners and their behavior and connections.
- v. Competent enough to analysis and design of steel structures and able to provide the good quality control during the steel construction.

**Students Outcome : a, b, c, d, e**

**CEL 306 – Surveying-II**

**Credits:** 8 (Even Semester)

**Contact:** 3 Hrs lectures and 02 Hours Practical per week

**Instructor:** Dr. Anjan Patel

**Textbooks and Other Materials:**

- Surveying II, B. C. Punmia , Standard Book-House
- Surveying Volume II , S. K Duggal, Tata McGraw Hill
- Higher Surveying, A M Chandra , New Age International Publication
- Surveing & Levelling-Part II, T. P. Kanetkar & S. V. Kulkarni , Pune Vidhyarthi Griha Prakashan, Pune
- Title Surveying , Arthur Bannister, Stanley Raymond, Raymond Baker, Person Education

**Syllabus Description:** Theory: Curves, Geodetic Surveying, Hydrographic Surveying, Field Astronomy, Photographic Surveying, Triangulation; Practicals: Base Line Measurement, Study and Application of Auto Level , Study and Application of Total Station, Setting out of simple curves – linear methods, Setting out of simple curves – angular method, Setting out of transition curve, Computation

of geodetic position, Correction of geodetic quadrilateral, Triangulation Adjustments, Determination of Azimuth; Field Visit: A 3 days Survey Camp

**Prerequisites/Co-Requisites:**

**Course Role in Curriculum:** Core

**Course Objectives:**

1. To teach about the curve surveying for highways
2. Introduction to Geodetic surveying, Field astronomy, Triangulation, Photographic and hydrographic surveying.
3. To make the students able to do base line measurement and handle Auto Level & Total station in the field for various surveying works.
4. To teach how to compute for geodetic position, how to do triangulation adjustment and apply corrections in geodetic quadrilateral

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. do curve surveying for highways and railways curves
2. understand the basics of Geodetic surveying, Field astronomy, Triangulation, Photographic and hydrographic surveying.
3. use Auto level, Total stations and other advanced instruments in surveying
4. plan and doing surveying in a team for real life works.

**[Student Outcomes: a, d, j, k]**

**Course Topics:**

Curves: Types, Elements, Methods & Setting out curves

Geodetic Surveying: Triangulation, classifications, reconnaissance, base line measurements Triangulation: Laws of weights, errors & adjustments

Field Astronomy: Spherical trigonometry, Latitude & Longitude, Astronomy Terms, Co-ordinate System, Corrections.

Photographic Surveying: Photo-theodolite, terrestrial photogrammetry, stereo photogrammetry, aerial surveying

Hydrographic Surveying: Shore-line survey, soundings, methods, reductions plots, tides.

Practicals: Base Line Measurement, Study and Application of Auto Level , Study and Application of Total Station, Setting out of simple curves – linear methods , Setting out of simple curves – angular method, Setting out of transition curve, Computation of geodetic position, Correction of geodetic quadrilateral, Triangulation Adjustments, Determination of Azimuth

*Field Visit: 3 days Survey Camp will be conducted as a part of course curriculum*

**CEL 307 – Project Planning and Management**

**Credit Hours:** 3 ( Odd Semester)

**Contact:** 3 Hrslectures per week,

**Instructor:** Prof. S.P.Wanjari

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

1. P G. Gahoit&B.M. Dhis, Construction Management New age international (p) Ltd.
2. Srinath L, CPM& PERT, East-West Press Pvt. Ltd New Delhi.

3. Frank Harris & Ronald Mc.Caffer, Modern Construction Management, Blackwell Sience. 4th Edition.
4. N.D. Vorer, Quantitatic Techniques in Management, Tata McGraw Hill, New Delhi, 3rd Edition.

**Syllabus Description:**

Introduction: Significance of construction management, objectives & function, resources, and stages in construction, construction team.

Project planning: Bar charts, CPM and PERT analysis, line of balance method. Resources levelling.

Construction safety: Importance of safety, safety measures, accident cost and its prevention. National safety Council.

Materials management: Functions and objective, Inventory control, EOQ, ABC analysis Equipment Management: Classification, selection, operation & maintenance, depreciation & replacement cost, cost of owning. Equipment of major projects: Excavating Machines (Shovels, draglines, Bulldozer, Scrapper), Drilling & blasting, transporting & Handling equipment (Cranes, Hoists, Conveyor belts, Dumpers, Cableways). Shotcreting, Guniting, Concrete equipments: Mixers, vibrators, batch mixing plants.

**Prerequisites/Co-Requisites: No**

**Course Role in Curriculum: Core Course**

**Course Objectives:**

- 7.Importance of Project Management as a Civil Engineer.
- 8.Current Construction scenario
- 9.Understanding Project Planning by Different methods
10. Understanding quality and safety at construction site
11. Understanding types of Construction equipment and its rate analysis
12. Understanding material management at construction site

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Planning of various construction projects such as Building, Roads, etc.
2. Manpower requirement planning during project
3. Equipment planning
4. Material planning
5. Quality and Safety measures at Site

**Student Outcomes: [ a,b,d,e,k]**

**Course Topics:**

Introduction of Construction management  
 Stage of construction  
 Bar chart planning & Problem solving  
 CPM Planning & Problem solving  
 Manpower Planning & Problem solving  
 PERT Planning & Problem solving  
 Misc Planning Methods such LOB, CCM, Matrix Methods  
 Construction Safety  
 Construction Quality control and quality assurance  
 Construction Materials planning  
 Introduction of Construction Equipment, Problem for rate analysis with using



equipment

### **CEL401– Irrigation Engineering**

**Credits : 6+ 2= 8** (Even Semester)

**Contact : 5 Hrs**, lectures per week-**3**, Design Exercise-**2**

**Instructor : D. J Katyayan**

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

#### **Textbooks and Other Materials :**

*Required :*

Irrigation Engineering - Garg Santosh Kumar, Khanna Publishers, New Delhi, 2002

Irrigation Engineering - Aasawa G L, Wiley Eastern Ltd., 1996

*Supplemental Material :*

Engineering for Dams- Creager, Justin, Hinds, 1995

Design of Small Dams - U. S. B. R. Publication, 1960

#### **Syllabus Description**

**Prerequisites:** Nil

**Course Role in Curriculum :** Core Course

#### **Course Objectives :**

- 1.To get a feel of problems involved with Irrigation Engg.- socio Economic
- 2.To get acquainted with various types & requirements of irrigation, soil moisture relationship Crop patterns.
- 3.Design & construction of various types of dams.
- 4.Water conveyance systems – canals & allied structures.

#### **Course Outcomes :**

At the completion of this course, the student will be able to

- 1 Relate with socio economic aspects of agriculture.
- 2 Understand & assess requirements of irrigation
- 3 Have insight of planning & design of storage irrigation systems- Dams.
- 4 Plan & design irrigation water conveyance systems

[ **Student Outcomes : a, c, e, h** ]

#### **Course Topics :**

Introduction - General, Necessity, importance, scope and development of Irrigation.

Classification and comparative study irrigation systems.

Quality of irrigation water,

Soil moisture – Consumptive use, water requirements of crops Duty-Delta-Base period.

Reservoir Planning & Management

Dams: Different types, their suitability, selection, analysis and design.

Weirs & Spillways

Irrigation Canals and related structures.

### **CEL 402 – Estimating and Costing**

**Credit Hours:** 3 (Even Semester)

**Contact:** 3 Hrs lectures per week,

**Instructor:** Dr. Shilpa Dongre

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

*Required:* 1. Estimating and Costing in Civil engineering- Theory and practice by B. N. Dutta, revised Edn., UBS Publishers Dist. PVT. Ltd.

2. Estimating, Costing and Contracts by S. C. Rangwala, Charotar Publ.

*Supplemental Materials and Web Links:* as provided at the course Blackboard site

**Syllabus Description:** Estimate and estimation, types, detailed estimate of structures. Technical specifications, writing principles. Contracts – forms, types of contracts, procedures of arranging contracts, conditions of contracts. Rate analysis. Valuation. PWD accounts and procedures.

**Prerequisites/Co-Requisites:** CEL 204 and CEL 205.

**Course Role in Curriculum:** Core

**Course Objectives:**

1. Introduce to estimation methods and teach to working out cost of projects,
2. Introduce to specifications, their types and standard way of writing,
3. Introduce to Contracts, their role in civil engineering construction, and procedures of arranging contracts,
4. Teach rate analysis for various items in construction,
5. Introduce to valuation, methods of building and land valuation and teach valuation of Properties,
6. Introduce to working procedures of PWD and accounting.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Estimate the cost of any building
2. Design technical specifications for any project
3. Invite tenders and arrange contracts on behalf of Govt.,
4. Carry out rate analysis of various items in construction,
5. Fix the value of built up properties and land, fixation of rent for a property,

**[Student Outcomes: a, b, f, k]**

**Course Topics:**

Estimate and Estimating: purposes, types and methods of building estimates, detailed estimation of civil engineering works.

Specifications: objectives, types, principles of specification writing, typical specifications.

Contracts: forms of contract, termination of contracts, procedure of arranging contracts, conditions of contract:

Rate analysis.

Valuation: purposes, forms of value, methods of valuation of buildings and land valuation, rent fixation.

P.W.D. accounts and procedure for works.

**CED 401 Project Phase I**

**CED 402 Project Phase II**

**CEL 208 – Hydrology**

**Credit Hours:** 3 (Even Semester)

**Contact:** 3 Hrs lectures per week,

**Instructor:** Dr. Avinash Vasudeo

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

1) *Required:* a. Subramanya K; Engineering Hydrology; Tata McGraw-Hill New Delhi, 1996

b. Chow Ven Te, Maidment R David, Mays W Larry; Applied Hydrology; McGraw-Hill New Delhi, 1998.

c. Raghunath; Hydrology; Wylie Publication, 1996.

2) *Supplemental Materials and Web Links:* as provided at the course Blackboard site

**Syllabus Description:**

Water cycle introduction, importance of Hydrology, systems involved in hydrological cycle, its components and their dependence. World water balance, need of recording and measurement of different components of the hydrological cycle. Statistical methods, graphical methods used in estimation of different parameters of the hydrological cycle and the use of analysis in Civil Engineering.

**Prerequisites/Co-Requisites:.** N A.

**Course Role in Curriculum:** Core/ Elective Course

**Course Objectives:**

1. Introduce to Hydrology.
2. Making students understand the importance of Water Resources.
3. To expose the students to the various components of the water cycle and their importance.
4. Teach data analysis using various techniques and implementation of the results.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Realize the importance of water.
2. Hydrological cycle and various components.
3. Will develop analytical skills in handling variety of data.
4. Latest problematic issues and developments.

**[Student Outcomes: a, b, c, d, e]**

**Course Topics:**

Introduction, Hydrological cycle and detailed study of each component. Measurement of discharge of a stream, Area – Slope and Area – Velocity methods. Flood hydrographs and its components, S-Curve technique, unit hydrograph, complex hydrograph, synthetic hydrograph. Statistical Methods, Various methods of

averages, probability of an event, Frequency analysis.  
Floods: Causes and effects, Factors affecting peak flows and its estimation, Flood routing and Flood forecasting.  
Groundwater: Introduction, Occurrence and distribution of Groundwater, Water table, Darcy's law, Introduction to hydraulics of wells, Open wells -yield test

### **CEL 309 - Fluid Mechanics**

**Credits : 4** (Odd Semester)

**Contact : 3 Hrs** lectures per week, 2 Hrs lab per week

**Instructor : Dr. A. D. Ghare**

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

#### **Textbooks and Other Materials :**

*Required :* Engineering Fluid Mechanics, Edition 2003, Garde R. J. and Mirajgaonkar A. G. , Scitech Publications

*Supplemental Material :* Fluid Mechanics, Edition 2010, Streeter V. L., Wyle E. B. and Bedford K. W. , Tata McGraw Hill

**Syllabus Description :** Relative equilibrium of fluids, Hydro-kinematics, Boundary Layer Theory, Laminar flow through pipes, Analysis of pipe flow, Dimensional Analysis, Model Analysis, Drag and Lift ,Open channel flows

**Prerequisites:** CEL 202 Hydraulic Engineering

**Course Role in Curriculum :** Elective Course

#### **Course Objectives :**

1. Analyse relative equilibrium of fluids
2. Teach Hydro-kinematics
3. Introduce Boundary Layer Theory
4. Analyse flow through pipes and channels
5. Teach Drag and Lift forces
6. Introduce Model Analysis in hydraulics

**Course Outcomes :** At the completion of this course, the student will be able to

1. Analyse the relative equilibrium of fluids
2. Estimate various thickness terms associated with boundary layer
3. Use Moody's Diagram to assess head loss for flow through pipes
4. Analyse the flow through pipes
5. Compute drag and lift forces on immersed bodies
6. Analyse the uniform flow and critical flow conditions in open channel flows

[ **Student Outcomes : a, b, e, h** ]

#### **Course Topics :**

Relative equilibrium of fluids

Liquid masses subjected to uniform horizontal and vertical acceleration

Acceleration of fluid mass along a slope

Free and forced vortex  
Velocity potential function and stream function  
Kinetic energy correction factor, Momentum correction factor  
Boundary layer theory  
Forces on immersed bodies, Drag and Lift  
Laminar incompressible flow in a circular pipe  
Moody's diagram  
Laminar flow between parallel plates  
Analysis of pipe flow- branching, networks  
Power Transmission through pipeline  
Flow through siphons  
Dimensional Analysis  
Model Analysis  
Dynamic similarity  
Uniform flow computations in open channels  
Critical Flow computations in open channel  
Concept of hydraulic jump  
Preliminaries of Gradually Varied Flows

**CEL 310 Energy Efficient Buildings**

**Credit Hours: 3 (Winter)**

**Contact: 3 Hrs lectures per week**

**Instructor: Dr. Rahul V Ralegaonkar**

**Textbooks & other materials:**

- Energy Efficient Buildings In India by Mili Majumdar [The Energy Research Institute](#).
- Energy-Efficient Building Systems Lal Jayamaha McGraw Hill Publication.

**Reference books:**

- Solar Energy and thermal processes J A Duffie & W A Beckman John Wiley.
- Energy Conservation Building Code, 2007.
- Handbook of functional requirement of buildings, SP: 41:1987.

**Syllabus description:** The course includes various theories and standards that are essentially required for energy conservation inside the functional buildings. The course also includes necessary tools that helps to analyse the energy demand and conservation means.

**Prerequisites/Co-requisites: -**

**Course role in curriculum:** Elective Course

**Course Objectives:**

1. To introduce the students about the correlation of energy and buildings.
2. To make students aware about the standards for demand supply management of energy in buildings.
3. To make students self efficient to audit the energy conservation challenges in building construction.

**Course outcomes:**

At the completion of this course, students would be able to

1. gain a broad understanding of energy efficient building designs.
2. identify, formulate, and solve engineering problems
3. contemporary issues and development
4. use the techniques, skills, and modern engineering tools necessary for engineering practice.

**[Student Outcomes: a,e,j,k]**

**Course Topics:**

Conservation & energy efficiency concepts-overview of significance of energy use and energy processes in buildings.

Solar energy fundamentals & practices in building design- solar astronomical relations and radiation physics and measurements, design decision for optimal orientation of building, shadow analysis.

Heating and ventilation design- Human thermal comfort, climatological factors, material specifications and heat transfer principles, Thermal performance evaluation, Heat loss from buildings, design of artificial ventilation system, design of insulators.

Design audits & economic optimization- Concept of cost/benefit of energy conservation & carbon footprint estimation.

Energy efficient lighting system design: Basic terminologies and standards, daylighting and artificial lighting design, auditing.

Advances in computational energy conservation- implementation of computer energy simulation programs into building designs.

**AML 461- Advanced Structural Analysis**

**Credit Hours (3-1-0); (Odd Semester)**

**Contact: 3+1 hours per week**

**Instructor: Dr. R S Sonparote**

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks:**

1. Timoshenko S. P.; & Young D.H. "Theory of Structures; International edition", McGraw Hill, 1965.
2. Ghali, A.; & Neville A. M. "Structural Analysis A Unified Classical and Matrix Approach (4th Edition)", E & FN SPON; Van Nostrand Reinhold, 1997.
3. Wang, C. K. "Indeterminate Structures", Prentice Hall of India; 2000.
4. Schodek, D.L. "Structures (4th Edition)", McGraw Hill International editions; 1983.
5. Meghre, A.S.; & Deshmukh, S.K. "Matrix Methods of Structural Analysis (1st Edition)", Anand; Charotar Publs, 2003.
6. Weaver J.M.; & Gere, W. "Matrix Analysis of Framed Structures (3rd edition)", Van Nostrand Reinhold; New York, 1990.

**Syllabus Description:** Different types of indeterminacy of structure, Different methods of analysis of frames, continuous beams and trusses, Approximate methods of analysis of indeterminate structures, Non-prismatic beams.

**Prerequisites/Co-Requisites:.....**

**Course Role in Curriculum:** Elective Course

**Course Objectives:**

9. Introduce static and kinematic indeterminacy
10. Teach equilibrium based methods of analysis of indeterminate structure
11. Teach compatibility based method of analysis of indeterminate structure
12. Introduction to non-prismatic beam and its stiffness

**Course Outcomes:**

At the completion of this course, the student should be able to

4. Able to choose method of analysis for indeterminate structure
5. Able to understand stiffness method: structure as well as member approach
6. Able to analyse nonprismatic beams

[Student outcome: a,e,i,k]

**Course Topics:**

Kani's Method applied to symmetrical and unsymmetrical frames with sway (Up to single bay Two storey)

Moment Distribution applied to frames with sway correction,

Approximate method of Structural analysis for multi-storied frames with lateral loads (Portal and Cantilever method),

Approximate methods for vertical loads i.e. Substitute frame method etc. (Max three bay three storey)

Column Analogy method,

Applications to beams,

Calculations of Stiffness factors and carry over factors for non-prismatic members,

Analysis of non-prismatic fixed beams.

Concept of static indeterminacy of structures,

Formulation of Flexibility matrix and equations applied to simple trusses and continuous beams.

Flexibility matrix for non-prismatic members.

Concept of kinematics indeterminacy of structures,

Formulation of stiffness matrix and equations applied to simple trusses and continuous beams.

Stiffness matrix method applied to simple plane frames.

**AML 467- Advanced RCC**

**Credit Hours (3-1-0); (Even Semester)**

**Contact: 3+1 hours per week**

**Instructor: Dr. R S Sonparote**

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**AML 467- Advanced RCC****Textbooks and Other Materials:**

1. Jain, O.P.; & Jaikrishna, "Plain and Reinforced Concrete (Vol-I&II)", Nem Chnand & Bros; Roorkee.
2. Varghese, P. C., "Advanced Reinforced Concrete Structures", Prentice Hall of India, 2000.

3. Pillai, S.U.; & Menon, D., “Reinforced Concrete Design”, Tata McGraw Hill Publishing company Ltd. India, 1998.
4. “IS: 456; Code for Practice: Plain and Reinforced Concrete”, Bureau of Indian standards; New Delhi, 2000.
5. “IS: 875 (Part 1 to 4); Code for Practice for Design Loads (Other than Earthquake) For Buildings & Structures; Second Revision (5th Reprint)”, Bureau of Indian Standards; New Delhi, 1987.
6. “IS: 1893 (Part-1); Criteria for Earthquake Resistant Design of Structures; (5th Edition)”, Bureau of Indian Standards; New Delhi, 2002.
7. “IS: 13920; Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces- code of Practice; Second reprint-1996”, Bureau of Indian Standards; New Delhi, 1993.
8. “SP- 16; Design Aids for Reinforced Concrete to IS- 456”, 1980.
9. “SP- 34; Handbook on Concrete Reinforcement & Detailing and other relevant codes”, 1987.

**Syllabus Description:** Analysis and design of RCC buildings, bridges and watertanks

**Prerequisites/Co-Requisites:.....**

**Course Role in Curriculum:** Elective Course

**Course Objectives:**

1. Introduce different codes related to seismic analysis and design
2. Teach analysis (using software) and design of building components based on professional practice
3. Teach analysis and design of GSR and ESR
4. Introduction design of bridges

**Course Outcomes:**

At the completion of this course, the student should able to

6. Design a building from foundation to roof level
7. Read structural drawings of RCC building
8. Understand seismic analysis, design and detailing of building
9. Design water tanks on ground surface, underground tank and overhead tank
10. Design small bridges

**[Student outcome: a,b,c,d,e,f,j,k]**

**Topics**

Approximate analysis and design of building frames

Calculation of loads due to Dead load, Live load, Wind load, Earthquake loads (Codal co-efficient method only) on multistoried frames as per relevant IS codes

Design of elements of multistoried frames such as beams, columns, foundations etc.

Detailing of structures as per IS: 456 & IS: 13920.

Analysis and design of rectangular and circular tanks (Underground, on-ground and elevated) using coefficients given in IS: 3370

Analysis and design of staging for static, wind and earthquake forces

Design of foundations for ESRs.

Analysis and design of slab type bridges subjected to various types of IRC loads



Analysis and design of T-beam bridges (limited to two girders, simply supported ends) with load distribution as per Courbon's method.

**CEL 311 – Pavement design**

**Credit Hours:** 3 ( Even Semester)

**Contact:** 3 Hrs lectures per week,

**Instructor:** Dr. Vishrut Landge

**Textbooks and Other Materials:**

*Required:* Principles of Pavement Design. By..Yoder and Witezak, Design of functional pavements, by Yang

*Supplemental Materials and Web Links:* IRC codes 37, 58,15, SP &2 rural road manual PMGSY and various IRC publications . Web material and NPTL lecture series.

**Syllabus Description:** Mechanical properties of pavement material like aggregates, stone, sand, fly ash.Cement, design of flexible and rigid pavement.Maintenance and repairs of pavements.

**Prerequisites/Co-Requisites:** Transportation engineering

**Course Role in Curriculum:** Elective Course

**Course Objectives:**

1. Introduction to basic principles pavement design as per IRC .
2. Mechanical properties of pavement material like bitumen and cement.
3. Introduce rigid pavement design and its advantages over flexible pavement.
4. Pavement maintenance

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain broad understanding of mechanical properties of pavement material like bitumen and cement and various methods of pavement design being practiced in India
2. Design a pavement using relevant IS/IRC codes.
3. Carry out bitumen mix design

**[Student Outcomes: a, b, e, j]**

**Course Topics:**Pavement Mix Analysis: Aggregate blending, bituminous mix design – Marshall stability approach, concrete mix design for roads.

Pavement Basics: Types & comparison, vehicular loading pattern, loading pattern on airport pavement, factors affecting design and performance of pavements, airport pavement, environmental impact on pavements, subgrade requirements

Design of Flexible Pavements: Analytical approach, flexible pavement layers, ESWL, repetitions of load, techniques of design methods, wheel load analysis, traffic analysis, stress distribution in subgrade soil, Burmister's theories, group index method, CBR approach, IRC guidelines, CRV method, triaxial & McLeod method, present practices, shoulder design.

Design of Concrete Pavements: Westergaard's approach, temperature & frictional stresses, design of expansion & longitudinal joints, design of dowel & tie bars, IRC guidelines, present design practices.

**CEL 368 Advanced Hydraulics**

**Credits :** 8 ( Even Semester)

**Contact :** 3 Hrs lectures per week, 1 Hr tutorial per week

**Instructor :** Dr. A. D. Ghare

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials**

*Required* : Flow through open channels, Second Edition, Ranga Raju K G, Tata McGraw- Hill Publishing Company Limited, 2004

Fluid Mechanics, Edition 2010, Streeter V. L., Wyle E. B. and Bedford K. W. , Tata McGraw Hill

*Supplemental material* : Engineering Fluid Mechanics Volume II, Edited by S. Narsimhan, Orient Longman Ltd., 1975

**Syllabus Description** : Compound channels, Gradually Varied Flows, Computations of GVF, Hydraulic jump, Unsteady flow in pipelines, Water hammer, Surge tank system

**Prerequisites** : CEL 309 Fluid Mechanics

**Course Role in Curriculum** : Elective Course

**Course Objectives** :

1. Introduce compound channels
2. Teach GVF theory and applications
3. Introduce location of hydraulic jump and energy dissipation system
4. Introduce unsteady Bernoulli's equation
5. Teach water hammer computations and surge analysis

**Course Outcomes** : At the completion of this course, the student will be able to

1. Estimate equivalent roughness for compound channels
2. Analyse and compute the Gradually Varied Flow (GVF) profiles
3. Locate the hydraulic jump in prismatic channels
4. Compute water hammer pressures in long pipelines
5. Estimate maximum upsurge in Surge Tanks

[ **Student Outcomes** : a, c, e, h]

**Course Topics** :

Review of uniform flow and critical flow

Transitions

Compound channel

Equivalent roughness

Dynamic equation of GVF

Surface profiles

Hydraulic exponents

Direct integration methods for GVF computations

Step methods for GVF computations

Introduction to graphical and numerical methods

Location of hydraulic jump

Application of hydraulic jump

Stilling basin

Unsteady Bernoulli's equation

Time of establishment of flow

Rigid water column theory  
Water hammer in sudden and slow closure of valve  
Approximate water hammer pressure computations  
Surge tank system  
Types of surge tanks  
Analysis of flow in simple surge tank system

### **CEL 403 – Rural Water Supply and Sanitation**

**Credit Hours:** 3 (Odd Semester)  
**Contact:** 3 Hrs lectures per week,  
**Instructor:** Dr. Dilip H. Lataye

#### **Textbooks and Other Materials:**

##### *Required*

1. E.G. Wagner and J.N. Lanoix, Excreta Disposal for Rural Areas and Small Communities,
2. B.C.Punmia, Environmental Engineering-II, Laxmi Publication

##### *Supplemental Materials and Web Links:*

**Syllabus Description:** National Water policies, Rural water supply systems in India, design of slow sand filter, methods of removal of iron and manganese, fluoride, arsenic, salinity etc.

Introduction to rural sanitation, various rural sanitation programmes in India, low cost sanitation methods adopted in India.

**Prerequisites/Co-Requisites:** No prerequisite

**Course Role in Curriculum:** Elective

#### **Course Objectives:**

- To introduce about various rural water supply programmes in India
- To introduce various rural water supply schemes
- To introduce various rural sanitation programmes in India
- To introduce various low cost sanitation methods in India

#### **Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain a knowledge about various rural water supply programmes in India
2. Able to understand various water supply scheme, design of rural water supply schemes.
3. Able to understand about various rural sanitation schemes in India
4. Gain knowledge about the methods of low cost sanitation
5. Gain knowledge about the design of septic tanks.

#### **[ Student Outcomes : a, b c,d, e,k]**

#### **Course Topics:**

National Water Policy, Status of Rural water supply in India, National and State level programmes of RWS, Planning and implementation of rural water supply, problem village Source development, springs, dug wells, infiltration wells etc. Package water treatment plants, appropriate technology for removal of excess iron and manganese, fluoride, arsenic for drinking water, surface water treatment, slow sand filtration, disinfection in RWS.

Guidelines for Design of RWS, Types of RWS systems and their components, types of pipes, pumps used in RWS, Community participation in planning, design, O &M of RWS. Low Cost Sanitation Methods, Centralised and Decentralised Methods of Rural Sanitation, Pit Privy, Aqua Privy, Water Seal Latrine, Bore-hole Latrine, bucket Latrine Feuill'ees or Trench Latrine, Overhung Latrine, Compost Privy, Chemical Toilet, Double Pit Latrine, Pour Flush Latrine, Improved Double Pit Pour Flush Latrine, Septic Tank, design of Septic Tank, disposal of Septic tank effluent. Water Carried Methods of Excreta Disposal for Rural Areas, Excreta Disposal Programmes for Rural Areas Composting, Methods of Composting, Indore Method, Bangalore Method, NADEP Method, Vermicomposting Method, biodung Vermicomposting, Gobar Gas Plant, Sulabh Sauchalaya. Role of NGO's and GO's in Rural Sanitation Community Participation in Rural Sanitation.

**Name of Programme: B Tech (Civil Engineering )**

**Course Name: AML 425 Advanced Design of Steel Structures**

**Offered in: Semester VIII**

**Scheme and Credit: (3-1-0); Credits: 8**

**Type of Course: Elective**

**Course Objectives:**

- A. To introduce the various method for design of steel structures with loading standards as per codal provision.
- B. To qualify the students for elementary design of beam, beam-column, plate girders.
- C. To disseminate the knowledge for design of workshop buildings along with concept of use of cranes.
- D. To qualify the students for design of various connections.
- E. Introduction of steel-concrete composites for bridges and buildings

**Syllabus:**

Introduction to Allowable Stress Design, Plastic design, Load and Resistance Factor Design (LFRD). Loadings as per IRC, IRS, IS (IS:800, IS:875 part 1-V, IS:1893) applicable to various steel structures. Design of Beams, Beam-column, Plate Girders, Open web structures and Space structures. Bridges, Industrial Buildings including crane girders. Welded and riveted connections. Composite structures.

**Reference Books/Material:**

1. N. Subramanian, "Steel structure design practice", Oxford university press-2010.
2. R. Englekirk, "Steel Structures controlling behavior through design", John wiley & sons, 1994
3. Johnson, R.P. "Composite Structures of Steel and Concrete", Vol-I, Granada Publishing Ltd., London, 1994.

4. "Steel Design Manual", ELBS and Granada Publishers, London, 1990.

**Course Outcomes:**

- i. Capable of using all National as well as International loading and design methods for steel structures.
- ii. Capable of design of elements for steel construction.
- iii. Able to provides the design of industrial sheds with or without cranes, connections
- iv. Capable of providing the design of bridges using composite construction.
- v. Competent enough to scrutinize the analysis and design of steel structures.

**Student Outcome : a, b, c, d, e**

**CEL 404 – Railways, Airport, tunnels and Ports And Harbor Engineering**

**Credit Hours:** 3 ( Even Semester)

**Contact:** 3 Hrslectures per week,

**Instructor:** Dr. VishrutLandge

**Textbooks and Other Materials:**

*Required:* Railway Engineering, by saxena, sahishtkumar, Airport Planning & Design, Praveen Kumar

*Supplemental Materials and Web Links:* Indian railway code of practice, Web material and NPTL lecture series.

**Syllabus Description:** Introduction to various modes of transportation. Like railways, airports ports and harbors etc.

**Prerequisites/Co-Requisites:** Transportation engineering

**Course Role in Curriculum:** Elective Course

**Course Objectives:**

1. Introduction to basic design of railway , airport and ports.
2. Geometric design of railway tracks.
3. Planning of an airport design of airstrip and facilities at airport.
4. Planning of ports and harbors.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain broad understanding various modes of transportation and their interrelation.
2. will be able to design airport pavement using relevant IS/IRC codes.
3. Carry out bitumen mix design for pavement at airport

**[Student Outcomes: a, b, e, j]**

**Course Topics:**

**Railway** Transportation and its development, Long term operative plans for Indian Railways. Classification of Railway lines and their track standards, Railway terminology, Traction and tractive Resistance, Hauling capacity and tractive effort of locomotives, different Types of Tractions. Permanent Way: Alignment Surveys, Requirement, gauges, track section, Coning of wheels, Stresses in railway track, high speed track. Geometric design of railway track, Gauge, Gradient, speed, super elevation, cant deficiency, Negative super elevation, curves, length of transition curves, grade compensations.

**Airports**

Development of Air Transportation in India :, Airport site election. Modern aircraft's. Airport obstructions: Zoning Laws, Imaginary surfaces, Approach and Turning zone, clear zone, vert.

Clearance for Highway & Railway. Runway and taxiway design :Windrose, cross wind component, Runway Orientation and configuration. Basic runway length and corrections, runway geometric design standards.Taxiway Layout and geometric design standards.Taxiway and other areas. Air traffic control : Need, Network, control aids, Instrumental landing systems Ports: history and Development of water transportation in India :, site election. Modern vessels .water obstructions: , Approach and Turning zone, clear zone, vert. design of dolphins, Mooring berthing , Marine loading and unloading arms

**CEL 405 Industrial Waste Water Treatment Recycle & Reuse**

**Credit Hours:** 3 ( Even Semester) **(3-0-0); Credits 6**

**Contact:** 3 Hrs lectures per week,

**Instructor:** Dr. A. R. Tembhurkar

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

- 1.Nemerow N. L., Theories and Practices of Industrial Waste Treatment, Addison Wesley Publishing CO. NY. 2<sup>nd</sup> edition.
- 2.W.W. Eckenfelder, Industrial Water Pollution Control Mc-Graw Hill Book Co. 2<sup>nd</sup> edition.
- 3.Freeman H. M., Industrial Pollution Prevention Handbook McGraw Hill 1<sup>st</sup>. Edition
- 4.Central Pollution Control Board, India, Comprehensive Industry Document Series.
- 5.E.B. Besselièvre, The Treatment of Industrial Waste Mc-Graw Hill Book Co. 1<sup>st</sup>.Edition

**Syllabus Description:**

Industrial pollution and its measurement; Generation of Industrial wastewater, Disposal standards; Quantification and characterization of wastewater and its variations; Environmental impacts due to discharge of wastewater on streams, land and sewerage system; Industrial waste survey; Stream sanitation, stream sampling, Stream survey; Principles and techniques for Industrial Pollution prevention and control; Waste minimization; recent trends in industrial waste management, Cleaner technologies; Reuse, Recycling and Resource recovery; Volume and strength reduction; Equalization and proportioning; Neutralization; Methods of Disposal and treatment for removal of organic, inorganic, solids, pathogens, heavy metals and other pollutants; Alternatives and Synthesizing industrial waste treatment system; Joint treatment of industrial waste; CETP; Pollution control measures and Treatment of wastes from various industries viz. Pulp and paper, tanning, Sugar, Dairy, Chemical, Cement, Petroleum, Fertilizers, Metal Finishing, Etc.

**Prerequisites/Co-Requisites:** .....

**Course Role in Curriculum:** Core / Elective Course

**Course Objectives:**

1. To understand scientific, engineering and managerial principles to formulate and design of Industrial waste water treatment.
2. To understand the principles of waste minimization, Cleaner technologies,

- Reuse, Recycling and Resource recovery
3. To develop teamwork skills and provide opportunity to exercise professional judgment for selection and synthesis of appropriate treatment system for industrial wastewater and present technical information.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Understand and apply basic concepts of wastewater treatment.
2. Design system, component or processes for industrial wastewater treatment.
3. Understand how to identify, formulate and do engineering design calculations using hydraulic principles and calculation techniques for industrial wastewater treatment process.
4. Understand and demonstrate the process of developing treatment alternative flowsheets through case studies and team-oriented technical presentations
5. A knowledge of contemporary issues of industrial wastewater treatment.

[Student Outcomes: a, b, c, e, f, g, j]

**Course Name: CEL-406 : Advance Concrete Technology**

**Offered in: 7<sup>th</sup> Semester B.Tech CIVIL (Odd Semester)**

**Scheme and Credit: [(3-0-2); Credits: 8] (L-T-P)**

**Prerequisite Courses: CEL 304: Concrete Engineering**

**Type of Course: Elective**

**Contact: 3 Hrs lectures per week**

**Instructor: Dr. A.D.Pofale**

**Textbooks and Other Materials:**

1. Gambhir M.L: Concrete Technology Tata McGraw Hill (Second Edition) 1995.
2. M.S.Shetty:, Concrete Technology S.Chand& Company New Delhi 2005 .
3. P.Kumar Mehata, Paulo &J.M. Monteiro, Concrete microstructure, properties & materials, Prentice Hall INC & Mcgraw Hill USA.
4. Short &Kenniburg,: Light Weight Concrete, Asia Publishing House, Bombay 1963.
5. Orchard D.F.; Concrete Technology -Vol I. & II Applied Science Publishers (Fourth Edition) 1979.
6. Neville A.M., J.J.Brook: Properties of Concrete Addison Wesley 1999.

**Syllabus Description:**

Review of properties of cement, their physical and chemical properties, special purpose cements, Classification and properties of aggregates, soundness of aggregates, alkali aggregate reaction, thermal properties of aggregates, Importance of shape and Surface area and grading, gap graded and aggregates. Admixtures & construction chemicals, Use of Fly Ash, Silica Fumes, Metakaolin &GGBS in concrete.

Rheological behavior of concrete, requirements of workability of concrete, Effect of environmental conditions, Strength properties of hardened concrete, Impact, Dynamic and fatigue behaviour of concrete, shrinkage and creep of concrete, behaviour of concrete under fire.

Permeability and Durability of concrete, Parameters of durability of concrete, chemical attack on concrete, Production of concrete; batching mixing, transportation, placing, compaction of concrete. Special methods of concreting and curing of concrete, Hot weather and cold weather concreting, Guniting (Shotcreting)/

Concrete mix design, Basic considerations and choice a mix proportions, various methods of mix designs including IS Code method. Quality control and quality assurance of concrete, Acceptance criteria, Quality management in concrete construction, Inspection and testing of concrete. Non-destructive testing of concrete, core test and load test.

Special concrete such as high strength, Lightweight, heavy weight, vacuum processed concrete. Mass concrete, High performance concrete, Pumpable concrete, Self Compacting concrete, Air entrained concrete, Ferro cement, fiber reinforced concrete, Polymer impregnated concrete. Jet concrete. Deterioration and repair technology of concrete, Distress and type of repairs, crack sealing techniques.

**Course Objectives:**

- A. To disseminate the knowledge for understanding the basic differences between conventional concrete technology & Today's Modern & advanced concrete technology and their requirements
- B. To study the science & engineering of concrete.
- C. To design & proportion concrete mixes by using mineral admixtures.
- D. To study special concretes like high strength, high performance & self compacting concretes.
- E. To acquire a level for understanding & undertaking research problems in challenging concrete constructions

**Course Outcome:**

- i) Achievement of adequate knowledge in Concrete Technology which is ready for its immediate application in field concrete problems.
- ii) Achievement of adequate knowledge for designing concrete for industrial / severe/aggressive environments with understanding of science & engineering of concrete.
- iii) Acquired knowledge on Deterioration and repair technology of concrete.
- iv) Updated knowledge in design & research.
- v) Ready to work on construction demanding special requirements.
- vi) Acquired knowledge in various concrete construction methods & equipments in various challenging situations. Emergency preparedness in case repairs & rehabilitation of structures in case of disasters like earthquake, fatigue & dynamic loadings etc.
- vii) Theory substantiated by conducting practicals related field of concrete construction.

**Course Topics:**

1., special purpose cements, soundness of aggregates, alkali aggregate reaction, thermal properties of aggregates, Importance of shape and Surface area and grading, gap graded and aggregates.

2. Admixtures & construction chemicals, Use of Fly Ash, Silica Fumes, Metakaolin & GGBS in concrete.

3. Rheological behavior of concrete, requirements of workability & Strength of concrete, Impact, Dynamic and fatigue behavior, shrinkage and creep, behaviour of concrete under fire. Permeability and Durability of concrete, chemical attack on concrete

4. Production of concrete; batching mixing, transportation, placing, compaction of concrete. Special methods of concreting and curing of concrete, Hot weather and cold weather concreting, Guniting

**AML 424- Structural Dynamics**

**Credit Hours (3-0-2); (Odd Semester)**

**Contact: 3 hours per week**



**Instructor: Dr. R S Sonparote**

**Textbooks and Other Materials:**

1. Chopra, A.K., "Dynamics of Structures", Prentice Hall, 3rd Edition, NY, 1970.
2. Clough, R.W. & Penzin, J., "Dynamics of Structures", McGraw Hill, 1993.
3. Humar, J.L., "Dynamics of Structures", Prentice Hall, 1990.
4. Mario, Paz, "Structural Dynamics", CBS Publ. N-Delhi, 1995.
5. Timoshenko, S., "Advanced Dynamics", McGraw Hill Book Co, NY, 1948.
6. Meirovitch, L., "Elements of Vibration Analysis", 2nd Edition, McGraw Hill International Edition, Singapore, 1986.
7. Biggs, J.M., "Introduction of Structural Dynamics", McGraw Hill, NY, 1964

**Syllabus Description:** Undamped and damped free vibration of SDOF system, Forced vibration of undamped and damped SDOF system, Multidegree freedom system, Modal analysis, free and forced vibration of continuous system

**Prerequisites/Co-Requisites:.....**

**Course Role in Curriculum:** Elective Course

**Course Objectives:**

6. Introduce fundamentals of vibrations of SDOF system
7. Introduce damped and undamped system
8. Introduce free and forced vibration
9. Introduced free and forced vibration of MDOF system
10. Introduced free and forced vibration of continuous system

**Course Outcomes:**

At the completion of this course, the student should able to

6. Convert structure into SDOF system
7. Find response of free and force vibration (harmonic, periodic and transient) of SDOF system
8. Find natural frequency and mode shapes of MDOF system
9. Carry out modal analysis of MDOF system
10. Performe experiments and computer simulation of vibrating system

**[Student outcome: a,b, e, k]**

**Course Topics:**

Sources of vibration, types of excitations  
Principle and working of piezoelectric transducers  
Spring action and damping  
Degrees of freedom  
Application of Newton's laws, D'Alembert's principle, Single degree of freedom systems; Mathematical model of physical systems;  
Free vibrations of undamped and viscously damped systems;  
Coulomb damping material and radiation damping.

Response of viscously damped SDOF systems to harmonic excitation; Vibration Isolation, Force transmissibility and base motion;  
 Principle of vibration measuring instruments; Equivalent viscous damping; structural damping,  
 Response of an undamped SDOF to short duration impulse; unit impulse response.  
 Response of undamped system of rectangular, triangular and ramp loading; response to general dynamic excitation;  
 Duhamel integral method.  
 Response spectra, Numerical evolution of dynamic response of linear systems, Frequency domain analysis, Fast Fourier Transform  
 Multiple degree of Freedom system: Vibration of undamped 2 DOF systems; Response of 2 DOF to harmonic excitation, mode superposition, vibration absorber Lagrange equation and their application to lumped parameter models of MDOF (up to 3 DOF)  
 Free vibration of MDOF (up to 3 DOF) systems, methods of solving eigen value problems; iteration methods.  
 Dynamic response of MDOF (2 DOF) systems-modal superposition method.  
 Vibration of Continuous Systems: Free vibrations of Continuous systems-axial and transverse vibration of bars / beams. Response of continuous systems to dynamic loads.  
 Energy Principle, Rayleigh-Ritz method.

**CEL 575 – Ground Improvement Technique**

**Credits: 6 (Even Semester)**

**Contact: 3 Hrs lectures per week**

**Instructor: Dr. Anjan Patel**

**Textbooks and Other Materials:**

- Bowels, J. E, Foundation Analysis and Design, McGraw-Hill International Edition Singapore, 1997.
- Moseley, M. P, Ground Improvement, Blackie Academic & Professional, Boca Raton, Florida, USA, 1993.
- Teng, W. C, Foundation Design, Prentice-Hall of India Pvt. Ltd 2004
- Ground Improvement Technique, Purushothama Raj, Laxmi publication.
- Ground and Soil Improvement, C. Raison and C A Raison, Thomas Telford Publishing, 2004
- *Supplemental Materials and Web Links:* as provided at the course Blackboard site. Related IS, BIS and ASTM Codes.

**Syllabus Description:**

- Introduction and Economic considerations of various ground improvement techniques.
- Introduction to various ground improvement technique such as preloading and sand drains; micropiling, granular columns, Stone columns; lime columns; vibrofloatation, blasting; dewatering, vacuum dewatering, electroosmosis, Ground freezing and thermal stabilization; Grouting, Reinforced earth and applications of geosynthetics, Ground anchors and soil nailing.
- Problems and case histories

**Prerequisites/Co-Requisites:** Basic Soil Mechanics and Foundation Engineering

**Course Role in Curriculum:** Elective

**Course Objectives:**

1. To be Introduced with various ground improvement techniques
2. To have a knowledge of the various geotechnical issues related to different techniques
3. Planning and design for ground improvement techniques for different site conditions

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. suggest and design a suitable ground improvement methods for a given site condition
2. supervise field works for various ground improvement methods.

[Student Outcomes: a, c, e, j, k]

**Course Topics:**

Introduction, Economic considerations, Consolidation by preloading and sand drains; strengthening by micropiles, granular columns, Stone columns; lime columns; Compaction by vibrofloatation, blasting ; dewatering, Improvement of deep strata of fine soils by vacuum dewatering, electroosmosis. Ground freezing and thermal stabilization; Grouting techniques and principles. Reinforced earth and applications of geosynthetics; retaining walls, slopes, road erosion. Ground anchors and soil nailing; Problems and case histories

**CEL 409 Quality and Safety in Construction**

**Credit Hours: 3 (Winter)**

**Contact: 3 Hrs lectures per week**

**Instructor: Dr. Rahul V Ralegaonkar**

**Textbooks & other materials:**

- Quality Planning and Analysis by Juran Frank, J.M. and Gryna, F.M., Tata McGraw Hill, 1982
- Construction Safety Management Levitt, R.E. and Samelson, N.M. Mc. Graw Hill Book Company, Inc., N.Y., 1991

**Reference books:**

- Total Quality in Construction Projects, Ron Baden Hellard, Thomas Telford, London
- Statistical quality Control, Grant E.L. and Leavensworth, McGraw Hill
- Construction Safety Management, [Raymond Elliot Levitt](#) & [Nancy Morse Samelson](#), Amazon

**Syllabus description:** The course includes various theories and standards that are essentially required to meet desired standards for the relevant construction industry project be it at manufacturing level, organizational level or at execution stage. The course also includes necessary tools which help for quality audit of construction related projects. Safety related aspects are also well covered under the framed syllabus which needs to be followed on site during execution stage.

**Prerequisites/Co-requisites:** Compulsory courses of core discipline must be completed upto 3<sup>rd</sup> year.

**Course role in curriculum:** Core/Elective Course

**Course Objectives:**

1. To introduce the students about quality and safety related challenges in construction industry
2. To make students aware about the globally recognized guidelines/theories for

- quality and safety in construction
3. To make students self efficient to audit quality and safety related challenges in construction

**Course outcomes:**

At the completion of this course, students would be able to

5. gain a broad understanding of quality and safety in construction
6. an ability to function on multidisciplinary teams
7. contemporary issues and development
8. use the techniques, skills, and modern engineering tools necessary for engineering practice.

**[Student Outcomes: a,d,j,k]**

**Course Topics:**

Total quality management concepts; ISO9000; QA/QC systems and organizations, Quality Audits; Problem solving techniques; Statistical Quality Control; Quality Function Deployment; Material Quality Assurance; Specifications and Tolerances.

Safety issues; Injury accidents and their causes; Safety program components; Role of workers, Supervisors, Managers and Owners; Safety Procedures for various construction operations; Safety audits; Safety laws, Safety policies, safety organization, safety committees, safety representatives, outside agencies – Govt. intervention, international agreements.

**CEL 410 –Traffic Engineering**

**Credit Hours:** 3 ( Even Semester)

**Contact:** 3 Hrslectures per week,

**Instructor:** Dr. VishrutLandge

**Textbooks and Other Materials:**

*Required:* Traffic Engineering – Theory & PracticePignataro, L.J.,Traffic Engineering and Transport PlanningL.R.Kadiyali

*Supplemental Materials and Web Links:* Highways- Traffic Planning & Engineering, Website of IRC various IRC codes. Web materials NPTL materials

**Syllabus Description:**Traffic engineering, Traffic flow theory, Traffic demand estimation, Facility planning, Traffic safety,road safety audit,field studies. Traffic Engineering planning principals. Urban transport planning.Geometric design of road alignments,Highway capacity.Capacity of signalized intersection.Problems of heterogeneous traffic.

**Prerequisites/Co-Requisites:** Transportation engineering

**Course Role in Curriculum:** Elective Course

**Course Objectives:**

1. Introduction to basic principles of traffic analysis and planning .
2. Traffic safety and safety audit.
3. Introduce urban transportation planning.
4. Highway capacity and los of the traffic facility

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain a broad understanding of Traffic analysis and planning needs
2. Learn to incorporate safety in planning a facility

3. Gain knowledge of level of service of a facility. Understand needs of the users.
4. Contemporary issues and developments.

**[Student Outcomes: a, b, e, j]**

**Course Topics:** Traffic Engineering & Studies:

Scope, traffic elements, characteristics-vehicle, road user and road; traffic studies-volume, O & D, parking, safety, study methodology, data collection & presentation, Traffic Analysis: Speed, volume, parking & accident data analysis, statistical approach, conflict points, traffic stream characteristics- relationship between speed, flow and density, LOS & capacity analysis, traffic forecasting.

Traffic Design: Channelisation of islands, design of rotaries, intersections, pedestrian & bicycle ways, Traffic Control Devices: Traffic signs, markings and signals; Traffic Regulation & Management: Speed, vehicle, parking, enforcement regulations, mixed traffic regulation, management various techniques  
Geometric design provisions for various transportation facilities as per AASHTO, IRC

Design

**CEL 411 Geotechnical Engineering**

**Credits : 6** (Even Semester)

**Contact : 3 Hrs**, lectures per week-3,

**Instructor : D. J Katyayan**

**Textbooks and Other Materials :**

*Required :*

Soil Mechanics in Theory and Practices- Alam Singh, Asia Publishing House.

Geotechnical Engineering - S.K. Gulhati, , Tata McGraw Hill

Geotechnical Engineering- Purushottam Raj, , Tata Mc Graw Hill,

Soil Mechanics and Foundation- Punmia B.C, , Laximi Publication,

Geotechnical Engineering- C.Ventatramaiah, , New Age International Ltd.

**Syllabus Description**

**Prerequisites:** Nil

**Course Role in Curriculum :** Elective Course

**Course Objectives :**

1. To get an insight of problems involved in Foundation Engineering.
2. To get acquainted with various types & requirements of different characteristics of soils in Civil Engineering.
3. Design & construction of various elements involving soil behaviour.
4. Exposure to various techniques employed while handling problematic soils.

**Course Outcomes :** At the completion of this course, the student will be able to -

- 1 Gets an insight of problems faced in handling foundation problems.
- 2 Understand behaviour of soils.
- 3 shall be able to design/ handle during executions situations posed by problematic soils.
- 4 Shall have a pre exposure to advanced techniques.

**[ Student Outcomes : a, c, e, k]**

**Course Topics :**

1. Clay mineralogy: Concept of composition classification and nomenclature, structure of clay minerals. 2. Drainage and Dewatering: Various systems of and there Graded filters and design Criteria applications of Geomembranes.

3. Expansive Soils: Identification and classification, Foundation problems, foundation design principles.
4. Compaction & field compaction and controls: Mechanics, Lab & Fd. Tests, Fd. Compaction equipments & these choice and suitability, quality control.
5. Consolidation: Terzaghi's theory for two & three dimensional consolidation field and laboratory tests. Consolidation settlements.
6. Soil stabilization, Mechanical and Chemical stabilization, Field Techniques, Advanced Techniques.
7. Case studies of Applications

**CEL 412 - Spatial Analysis for Resource Management**

**Credits : 8** (Odd Semester)

**Contact : 3 Hrs** lectures per week, 2 Hrs lab per week

**Instructor : Dr. Y. B. Katpatal**

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars, Practical Exam

**Textbooks and Other Materials :**

*Required* : **Remote Sensing and Geographical Information System**, Edition 2006, M. Anji Reddy B S Publications

*Supplemental Material* : Geographic Information System, Edition 2001, Paul A. Longley, Michael F. Goodchild, Wiley

Remote Sensing and GIS, Edition 2008, B. Bhatta, Oxford Publication.

**Syllabus Description** : Fundamentals of Remote Sensing and GIS, GPS. Spatial data characteristics. Information extraction from spatial data, Digital Image processing, data generation in GIS, various spatial techniques for information generation, Applications in different areas.

**Prerequisites:** CEL 416 ( for UG students )

**Course Role in Curriculum** : Core course for WRE, Elective for Transportation and Environmental Engineering

**Course Objectives :**

1. Understand Remote sensing process
2. Carry out georeferencing and Digital Image Analysis
3. Teach them the concept of GIS and its applications
4. Learn vision development through spatial analyses
5. Carry out analyses in absence of field data
6. Carry out spatial analyses for resource management
7. Generate research orientation in students

**Course Outcomes** : At the completion of this course, the student will be able to

1. Understand the remote sensing data products
2. Generate digital data in different spatial formats
3. Understand spatial, 3D, Network and proximity analysis
4. Understand the use of Customised products
5. Visualize resources and their interaction
6. Analyse the spatial data and provide solutions

[ **Student Outcomes : a, b, d, e, i, k** ]

**Course Topics :**

Fundamentals of Geoinformatics  
Characteristics of Raster and Vector Data,  
Spatial and non spatial information,  
Data formats and data conversions.  
RS as a technology for data extraction and techniques,  
Multithematic data extraction using multispectral sensors, thematic map generation.  
Overlay analyses,  
Buffer analyses,  
Query shell.  
Spatial analysis, Modeling of spatial data,  
Network analysis,  
Digital terrain elevation models, Customization and Decision Support Systems.  
Applications of Geoinformatics for spatial management of resources:  
Run-off estimations,  
Infiltration characteristics,  
Groundwater potential and recharge characteristics,  
Watershed management,  
Watershed prioritization,  
Sediment yield estimation,  
Reservoir capacity studies,  
Spatial analyses for Environment Impact assessment,  
Monitoring and feedback, Natural indices,  
Concept of E-Governance using Geoinformatics.  
Integrated applications using various technologies within Geoinformatics; methods and approach.  
Real time and temporal analysis using Geoinformatics.  
Multidisciplinary applications of Geoinformatics; integration of various segments.  
Geoinformatics for resources management and utilities management.

**Practicals oriented for**

Spatial Digital Data and its Formats  
Digital Image analysis and Classification  
Vector Data generation, topology building and attribution  
Overlay, Buffer and Network analysis  
Models for Resource analysis

**Course Name: CEL-413 :Prestressed concrete Structures. [(3-1-0); Credits: 8]**  
**Pre requisite Courses. CEL 304 – Concrete Engineering &CEL:305 –Design of RCC structure**

**Course Offered in: Odd Semester**

**Scheme and Credit: [(3-1-0); Credits: 8] (L-T-P)**

**Type of Course: Elective**

**Reference Books/Material:**

1. Nigel R Hewon; Prestressed Concrete Bridges, Design and construction. Thomas Telford London 2003.

2. Plain Cast Precast and Prestressed concrete (A Design Guide) Devid A.Sheppard & William R. PhillipsMcgraw Hill Publication Co. 1989.
3. N. Krishnaraju Prestressed Concrete Tata McGraw Hill (Third Edition) 1981.
4. Lin T.Y &, Burns N.H. Design of Prestressed Concrete Structures. John Wiley & sons (Third Edition).1982.

**Course Topics:**

- 1.Design of high strength concrete mixes. Loss of prestress in single span and continuous beams. Use of IS 1343-1980,
- 2.Analysis Limit State Design of beams for Tension Type II and III problems, Cracking moment, Untensioned reinforcement, Partial prestressing, Stress Corrosion.
3. Transfer of prestress by bond, Transverse tensile stresses, End zone reinforcement. Behaviour of Bonded and unbonded prestressed concrete beams.
4. Deflection of Prestressed concrete members, short and long term, control of deflections. Crack width considerations. Flexural strength of prestressed concrete sections: Types of flexural failures, Limit state concept.
5. Shear resistance of prestressed concrete members: Principal stresses and ultimate shear Resistance, Design of shear reinforcement, prestressed concrete, members in Torsion, Design of reinforcement in torsion shear and bending.
6. Stress distribution in end block, Analysis and Anchorage Zone reinforcement. Composite
7. Construction of, prestressed precast and cast in situ concrete. Statically Indeterminate structures: Continuous beams, primary and secondary moments, Continuity, concordant cable profile, Analysis and Design of continuous beams.
8. Prestressed concrete pipes and poles. Design of Prestressed concrete tanks. Prestressing of dams and bridges: Method of construction. Stage prestressing, Dynamic and Fatigue behaviour of prestressed concrete.

**Course Objectives:**

7. To bring the civil engineers to such a level so to as enable them, to take the appropriate decision in respect of choice of Prestressed section over R.C.C .
8. To make the learners to be aware of such a highly mechanized technology in civil engineering construction.
9. To imbibe the culture of entrepreneurship in precast prestressed industry in mass housing .railway sleepers, electric transmission poles etc.
10. To understand the basic design considerations in prestressed concrete structures in relation to its applications.
11. To employ & develop new techniques in rehabilitation of distressed structures like buildings , Bridges & infrastructures..
12. To make prepared for undertaking research problems in prestressed concrete.

**Course Outcomes:**

5. Achievement of adequate knowledge in prestressed concrete structures ready for its dissemination & application.
6. Achievement of adequate knowledge in industrial requirements of prestressed concrete.
7. Emergency preparedness in case repairs & rehabilitation of structures in case of disasters like earthquake, fatigue & dynamic loadings etc.
8. Updating of knowledge in design & research.

**Syllabus:**

Design of high strength concrete mixes. Loss of prestress in single span and continuous beams. Use of IS 1343-1980, Analysis Limit State Design of beams for Tension Type II and III problems, Cracking moment, Untensioned reinforcement, Partial prestressing, Stress Corrosion.

Transfer of prestress by bond, Transverse tensile stresses, End zone reinforcement.



Behaviour of Bonded and unbonded prestressed concrete beams.  
Deflection of Prestressed concrete members, short and long term, control of deflections.  
Crack width considerations. Flexural strength of prestressed concrete sections: Types of flexural failures, Limit state concept.  
Shear resistance of prestressed concrete members: Principal stresses and ultimate shear Resistance, Design of shear reinforcement, prestressed concrete, members in Torsion, Design of reinforcement in torsion shear and bending.  
Stress distribution in end block, Analysis and Anchorage Zone reinforcement. Composite Construction of, prestressed precast and cast in situ concrete. Statically Indeterminate structures: Continuous beams, primary and secondary moments, Continuity, concordant cable profile, Analysis and Design of continuous beams.  
Prestressed concrete pipes and poles. Design of Prestressed concrete tanks. Prestressing of dams and bridges: Method of construction. Stage prestressing, Dynamic and Fatigue behaviour of prestressed concrete.

### **CEL 414– Water Distribution Systems**

**Credit Hours:** 3 ( Even Semester)

**Contact:** 3 Hrs lectures per week,

**Instructor:** Dr. Rajesh Gupta

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

*Required:* Bhavé , P.R. and Gupta R., Analysis of water distribution Networks, Narosa Publishing Co, New Delhi.

*Supplemental Materials and Web Links:*

Bhavé , P.R., Optimal Design of Water Distribution Networks Narosa Publishing Co, New Delhi.

Jeppson, R.W., Analysis of flow in pipe networks, Ann Arbor Science, Ann Arbor Michigan USA.

Walksi, T-M, Analysis of water distribution System, Van Nostand Reinhold G, New York USA, 1984.

CPHEEO, Manual on Water Supply and Treatment, Ministry of Urban Development GOI.

**Syllabus Description:** General Hydraulic Principles, Formulation of Equations for looped Water Distribution Networks, Analysis of flow in looped networks using Hardy Cross, Newton-Raphson and Linear Theory method, Introduction of Gradient method and other methods of analysis.

Analysis of Water distribution systems with controlling elements. Flow dependent analysis of multi-reservoir systems, Introduction to head-dependent analysis.

Node flow analysis of water distribution networks. Optimal and Economical diameter of pumping main. Water hammer consideration. Design of water distribution networks using Critical path method, Formulation of optimization model, Application of Cost-head loss ratio method and linear programming technique to optimal design of branched networks.

**Prerequisites/Co-Requisites:** .....

**Course Role in Curriculum:** Core/ Elective Course

**Course Objectives:**

1. Introduction to Water Distribution Networks
2. Methods for Analysis
3. Types of Analysis
4. Methods for Designs

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Types of problems in water distribution systems
2. Methods for analysis of existing network
3. Various types of analysis of the networks
4. Analysis of networks with controlling elements
5. Design of new networks and strengthening of existing system

**[Student Outcomes: a, c, e, k]**

**Course Topics:**

General Hydraulic Principles,  
 Head loss formulae - Darcy-Waisbach formula, Hazen – Williams formula, and other formulae  
 Series and Parallel connection of Pipes,  
 Equivalent Pipes,  
 Analysis of branched Water Distribution Networks.  
 Formulation of Equations for looped Water Distribution Networks,  
 Analysis of flow in looped networks using various methods,  
 Reservoirs, Pumps and Valves in Water distribution systems.  
 Flow dependent analysis of multi-reservoir systems,  
 Introduction to head-dependent analysis.  
 Node flow analysis of water distribution networks  
 Optimal and Economical diameter of pumping main  
 Design of pumping main considering diameter as continuous as well as discrete variable.  
 Water hammer consideration.  
 Design of water distribution networks using Critical path method,  
 Formulation of optimization model,  
 Application of Cost-head loss ratio method and linear programming technique

**CEL 415 Advanced Structural Design**

**Credits 8**

**Instructor: Dr.A.D.Pofale**

**Prerequisites Co-Requisites/:** CEL 304 – Concrete Engineering ( 3-0-2)  
 & CEL 305 – Design of RCC Structure ( 3-0-0)  
 & AML 363 Design of Steel Structures3-0-06

**: Course Role in Curriculum: DE(departmental Elective)**

**Text Book & Other materials References:**

1. Varghese P.C.; Advanced Reinforced Concrete Design, Prentice Hall of India.2001
2. Borg , Gennaro ; Structural Analysis , Affiliated East-West press ltd. Vam Nostrand co Design
3. Pillai ,S.U.,D. Menon Reinforced Design by, T M H Publication,(Second Edition)2003
4. Dr. Ramchanra; Design of steel structures- Vol. II ,(Fourth Edition),Standard pub house1984
5. Duggal S.K.; Design of steel structures, Tata McGraw Hill 1993.

6. Dayaratnam P.; Design of reinforced Concrete Structures.(Fourth Edition)Oxford& IBF
7. Baker A.L.L.; Steel skeleton E.L. B.S. London 1954
8. Neal B.G.; The Plastic Methods of Structural Analysis Chapman and Hall 1953
9. Ranganathan R.; Reliability Analysis & Design of Structures. Tata McGrawHill1990
10. Arya A.S.,J.L.Ajamani;Design of Steel Structures,Nemchand & Bros.1989

**Syllabus Description:**

**RCC Structures**

1. Design for Structural reliability and study of structural safety. Design of typical staircases, Design of flat slabs. Analysis and Design of Building frames Yield line theory for slabs.
2. Design of precast building elements, Design of Plain concrete walls and simple shear wall
3. Design of piers and abutments, Design of cylindrical and doubly curved shell by approximate method.

**Steel Structures**

4. Design of Steel tanks and chimney and bunkers
5. Plastic analysis and design for steel structures, plastic hinge concepts collapse load calculations. Design for upper bound and lower bound solutions and mechanisms. Design of single span and continuous beams, columns, Gable and Portal frames.
6. Design of light gauge steel sections and members, minimum weight design

**Course Objective**

6. To understand the Philosophy of Design of RCC & Steel Structural Elements with advanced concept.
7. To acquire the skill & knowledge about design of special & typical structures in steel & concrete.
8. To design simple structural forms in roof structures in RCC & steel.
9. To study the Concept of design with respect to plastic Design of steel structural elements.
10. To study the basics of Optimum & minimum weight design of structural elements.

**Course Topics:**

**RCC**

1. To study Reliability Concept & structural safety.
2. Design of Typical Staircases & flat slabs
3. Analysis & design of building Frames.
4. Design of precast elements
5. Design of simple RCC Walls & study of Concept of shear wall design..
6. Design of simple cylindrical shell roofs.
4. Yield line theory for slabs.

**CEL 416 - Remote Sensing and GIS**

**Credits : 6** (Even Semester)

**Contact : 3 Hrs** lectures per week,

**Instructor : Dr. Y. B. Katpatal**

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials :**

*Required :* **Remote Sensing and Geographical Information System**, Edition 2006, M. Anji Reddy B S Publications

*Supplemental Material :* Fundamentals of Remote Sensing Edition 2003, George

Joseph, University Press.

Geographic Information System, Edition 2007, Kang-tsung Chang, Tata McGraw-Hill

**Syllabus Description :** Fundamentals of Remote Sensing and GIS, GPS. Spatial data characteristics. Information extraction from spatial data, Digital Image processing, data generation in GIS, various spatial techniques for information generation, Applications in different areas.

**Prerequisites:** None

**Course Role in Curriculum :** Open Elective

**1. Course Objectives :**

2. Understanding the Geoinformatics approach
3. Teach fundamental principles involved in RS and GIS
4. Understand the Fundamentals of Remote sensing Products
5. Know the Indian Remote Sensing Program
6. Role of Remote Sensing for various surveys and information extraction
7. Know about different software available in RS and GIS
8. Learn fundamental procedures in RS and GIS
9. Teach data integration and defining problems in digital format

**Course Outcomes :** At the completion of this course, the student will be able to

1. Understand the remote sensing process
2. Understand digital data in different and their formats
3. Know about National and International RS Programs
4. Know about various satellites and images
5. Know about changing field practices in Survey
6. Know how to generate different types of digital data
7. Know about Application areas

[ **Student Outcomes : a, b, d, e, i, k** ]

**Course Topics :**

Definition & Scope of Remote Sensing  
Technologies within Geoinformatics  
Electromagnetic energy & spectrum  
Remote Sensing Systems,  
Sensors & Scanners, Resolution of sensors,  
Multispectral, thermal, LiDAR & Radar data  
Spectral Signatures  
Terrestrial, airborne & spaceborne platforms,  
Sunsynchronous & Geostationary satellites.  
Various earth resources satellites,  
Indian Remote sensing Program.  
Remote Sensing Data products & their types  
Digital data Formats, errors.  
Interpretation Techniques

Relief displacement and vertical exaggeration,  
Determination & calculation of elevation from Remote Sensing Data.  
Digital Image Processing  
Image rectification & restoration,  
Image enhancements,  
Image classification; supervised & unsupervised,  
Geographical Information Systems:  
Raster & Vector Data,  
Components of GIS,  
Concepts & basic characteristics of Vectorization,  
Topology generation, attribute data attachment,  
Editing and analysis.  
Global Positioning Systems: Types and method.  
Applications : Integrated approach of RS & GIS application;  
Geotechnical investigations for engineering Projects (dam site studies),  
Water resources management,  
Environmental Applications  
EMP and Land Use Land cover studies,  
Urban Planning and E-Governance.

**CEL 418 Energy Conversion and Environment**

**Credit Hours:** 3 ( Odd Semester) **(3-0-0); Credits 6**

**Contact:** 3 Hrs lectures per week,

**Instructor:** Dr. A. R. Tembhurkar

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials:**

1. Fowler J. M. Energy and the Environment McGraw Hill New York 2<sup>nd</sup> edition.
2. D. O. Hall, G. W. Barnard and P. A. Moss, Biomass for Energy in the Developing Countries, Current Roles, Potentials, Problems, Prospects, Pergamon Press Ltd, 1<sup>st</sup> edition.
3. W. C. Turner, Energy Management Handbook Wiley New York 1<sup>st</sup> edition.
4. P. Meier, Energy System Analysis for Developing countries, Springer Verlag 1<sup>st</sup> edition.
5. Dorothy J De Renzo, Energy from Bioconversion of Waste materials, Noyes data Corporation USA 1<sup>st</sup> edition.
6. Francis A. Domino Energy from Solid Waste – Recent Development, Noyes data Corporation USA 1<sup>st</sup> edition.
7. Oliver S. Owen , Daniel D. Chiras, Natural Resource Conservation – Management for Sustainable Future Prentice Hall Publications 6<sup>th</sup> edition.
8. McGraw Hill George Tachonobanoglous, Hilary Thesin, Samuel Vigil 1<sup>st</sup> International Edn.

**Syllabus Description:**

Overview of Global and Indian Energy Scenario; Resource Conservation and Environmental Movement; Flow of Energy Through Ecosystem; Renewable and Non- Renewable Energy Sources; Sustainable System of Energy; Energy and

Resources Conservation Strategies and Policies; Energy audit; Energy Conversion Methods: Thermal, hydro, nuclear, solar, wind, tidal, Energy Analysis; Energy economics; Future Energy Systems; Introduction to Fuel combustion fundamentals, formation of Pollutants, Measurements and Control; Alternative Energy sources Utilizations; Classification of Waste as Fuel; Waste to Energy options: Combustion, Gasification, anaerobic digestion, fermentation, pyrolysis; Fuels Derived from Waste to Energy Technology; Power Generation using Waste to Energy technology, Gas generations and collection in landfills, Potential for biomass and Biogas Energy system.

**Prerequisites/Co-Requisites:** .....

**Course Role in Curriculum:** Core Course

**Course Objectives:**

1. To understand environmental and societal needs and implications for renewable energy systems
2. To learn the fundamentals of energy conversion and their impacts on environment
3. To learn how to assess energy potential of energy sources
4. To learn environmental appraisal methods and techniques of environmental conservation

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Understand and apply basic concepts of energy conversion and environmental protection.
2. Understand fundamentals of waste to energy technology
3. Develop skill to conduct environmental appraisal, perform energy audit and assessment of energy potential of energy sources
4. Perform engineering calculations to design energy conversion systems using scientific and engineering principles
5. Understand contemporary environmental and social issues related to energy conversion

[Student Outcomes: a, c, d, e, f, g, h, i, j, k]

**CEL 419 – River Engineering**

**Credit Hours:** 3 (Even Semester)

**Contact:** 3 Hrs lectures per week,

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Instructor:** Dr. Avinash Vasudeo

**Textbooks and Other Materials:**

*Required:*

- a. Yang C.T. , Sediment Transport- Theory and Practice, The McGraw Hill Companies, Inc. New Delhi, 1996.
- b. Henderson F.M., Open Channel Flow, McMillan, New York, 1996.
- c. Chang H.H., Fluvial Processes in River Engineering, John Wiley, 1988.
- d. Simons D.B. and Senturk F., Sediment Transport Technology, Water Resources Publications, Fort Collins, Colorado, 1977.

*Supplemental Materials and Web Links:*

- a. Roudkivi, Fluvial Hydraulics, Pergamon Publishers.
- b. Garde R J and Ranga Raju K G, Mechanics of Sediment Transportation and Alluvial Stream Problems, Wiley Eastern Ltd., 1985.

**Syllabus Description:**

Introduction to sediment and Fluvial hydraulics, nature of problems; Origin and properties of sediments; Incipient motion of sediment particles; Regimes of flow; Resistance to flow; Bed load, Suspended load and total load transport; sediment samplers; Design of Stable channels; Alluvial stream and their hydraulic geometry; Variation in plan form of streams; River training and bank protection; Cut-offs ; Alluvial river models; transport through rivers.

**Prerequisites/Co-Requisites: N A.**

**Course Role in Curriculum: Core/ Elective Course**

**Course Objectives:**

1. Introduce to the application part of open channel flow.
2. Making students understand the importance of nature and the complications involved in natural processes..
3. To expose students to complex scenarios and explain hen the importance of various equations and the concepts in handling the situations.
4. To make students understand the correlation between complex natural events and the difficulties in addressing them from engineering view point.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Understand the relation between formulations and occurrences in nature.
2. Application of equations of Hydraulic Engineering in the understanding river systems.
3. Will develop analytical skills in handling variety of data.
4. State of art research and their applications.

**[Student Outcomes: a, b, c, d, e]**

**Course Topics:**

1. Origin and properties of sediments : Nature of sediment problems , origin and formation of sediments , properties of sediments , incipient motion of sediment particles , tractive force approach , cohesive materials.
2. Regimes of flow : Description of regimes of flow , ripple , dune , antidune , prediction of regimes of flow.
3. Resistance to flow & velocity distribution in alluvial streams : velocity distribution in turbulent flow over rough boundaries, resistance and velocity distribution in alluvial streams.
4. Bed load transport & saltation : Bed load equations, bed load equations based upon dimensional considerations and semi-theoretical equations, general comments on bed load equations , saltation..
5. Suspended load transport : Mechanism of suspension , equation of diffusion ,

sediment distribution equation , relations for suspended load, wash load , transport of suspended sediment.

6. Total load transport : Various approaches to the problem , methods to estimate total load transport , some approximate methods , sediment yield from catchments, sediment samplers and sampling .

### **CEL 420 – Earthen Dam**

**Credit Hours:** 3 (Even Semester)

**Contact:** 3 Hrs lectures 2 Hrs tutorials per week,

**Instructor:** Dr. Anirban Mandal

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

#### **Textbooks and Other Materials:**

*Required: Sower & Sally , Earth & Rock Fill dams, Asia publishing house. § Creager, Justine, Hinds, Engineering for Dams, John Wiley & Sons. & U. S. B. R., Design of Small Dams, IBH, Publishing and Web Links: as provided at the course Blackboard site*

**Syllabus Description:** Introduction, seepage analysis, slope stabilities, safety aspects, and Instrumentations.

**Prerequisites/Co-Requisites:** Soil Mechanics

**Course Role in Curriculum:** ~~Core~~/ Elective Course

#### **Course Objectives:**

1. Introduction of different type of dam.
2. Suitable condition for earthen dam.
3. Seepage analysis and control.
4. Safety aspects and monitoring.

#### **Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain a broad understanding of Dam Engineering.
2. Get accustomed with seepage analysis and stability analysis.
3. Knowledge of different instruments for monitoring and dam safety.
4. Contemporary issues and developments.

**[Student Outcomes: a, b, e, j]**

#### **Course Topics:**

Introduction to dam engineering, suitable conditions for Earthen and Rock fill dam

Slope stability analysis for earth dam

Discharge & seepage analysis, construction and safety aspects for dam

Instrumentation and monitoring details including monitoring data management

Tutorial for real type problem.

### **CEL 421 Hydraulic Structures 1**



**Credits : 6 ( Even Semester)**

**Contact : 2 Hrs lectures per week, 1 Hr tutorial per week**

**Instructor : Dr. A. D. Ghare**

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks and Other Materials**

*Required* : Irrigation Engineering and Hydraulic Structures, Garg Santosh Kumar, Khanna Publishers, New Delhi, 2004

*Supplemental material* : Design of Small Dams, U.S. Bureau Reclamation, Oxford and IBH Publication Co., New Delhi, 1960

**Syllabus Description** : Spillway types and classification, Spillway design considerations, Energy Dissipators, Culverts, River training works

**Pre-requisites** : CEL 309 Fluid Mechanics

**Co-requisites** : CEL 401 Irrigation Engineering

**Course Role in Curriculum** : Elective Course

**Course Objectives :**

6. Introduce spillway types
7. Teach design steps for overflow spillway
8. Introduce culvert design
9. Introduce river training works
10. Teach design of stilling basin

**Course Outcomes** : At the completion of this course, the student will be able to

6. Classify the spillways and know the functioning of each type
7. Design ogee spillway
8. Design stilling basin
9. Identify the required type of energy dissipator
10. Design culverts and guide bunds

[ **Student Outcomes : a, c, e, h** ]

**Course Topics :**

Review of dam system

Spillway components and types

Ogee spillway

Estimation of spillway design flood

Design of upstream and downstream profile of ogee spillway

Design of gated spillway

Design considerations of side channel, chute and shaft spillway

Tail Water Curve

Jump Height Curve

Selection of appropriate type of energy dissipator

Design of stilling basin

Design of culverts  
River training works  
Design of guide bunds

**CEL 417 Disaster Management**

**Credit Hours: 3 (Winter)**

**Contact: 3 Hrs lectures per week**

**Instructor: Dr. Rahul V Ralegaonkar**

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

**Textbooks & other materials:**

1. D B N Murthy Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.
2. S L Goel, Encyclopedia of Disaster Management, Deep & Deep Pvt. Ltd.
3. G K Ghosh, Disaster Management, A P H Publishing Corporation.
4. Satish Modh, Citizen's Guide to Disaster Management Macmillan.

**Syllabus description:** The course includes the multidisciplinary concept of disaster management. The course also includes broad concept of emergency operation centre to be established for developing nations.

**Prerequisites/Co-requisites: -**

**Course role in curriculum:** Elective Course

**Course Objectives:**

1. To introduce the students about the challenges/phases in disaster management.
2. To make students aware about technologies which can be implemented for solving the problem of disaster management.
3. To make students self efficient to solve the challenges with the aid of technological aids.

**Course outcomes:**

At the completion of this course, students would be able to

5. gain a broad understanding of disaster management.
6. Broaden the education necessary to understand the impact of disaster in a global, economic, environmental, and societal context
7. contemporary issues and development
8. use the techniques, skills, and modern engineering tools necessary for engineering practice.

**[Student Outcomes: a,h,j,k]**

**Course Topics:**

Introduction to Disasters- Overview, Classifications, causes, loss of resources

Disaster Risk Management- Objectives, Processes, Events, analysis, base-line data, forecasting and warning.

Emergency operation centre and IT aids- physical environment, IT Aids, Applications.

Techno-legal & Techno-financial aspects- regulatory mechanism for compliance, administrative structure for legal framework, additional cost on infrastructure, building by-laws.

Public-private agency co-ordination- federal, state and local disaster response organization and network, citizen and community role in disaster response and recovery.

Case studies: Natural and man-made disasters, preparedness and planning.

### **CEL 417 – Hazardous Waste Management**

**Credit Hours:** 3 (Odd Semester)

**Contact:** 3 Hrs lectures per week,

**Instructor:** Dr. Dilip H. Lataye

#### **Textbooks and Other Materials:**

##### *Required*

1. M. D. LaGrega, P.L.Buckingham and J.C.Evans, Hazardous Waste Management, McGraw-Hill, Inc., New York
2. W.S.Forester and J.H.Skinner, International Perspective on Hazardous Waste Management, Mudra Offset Printers, Bajaj Nagar Nagpur

##### *Supplemental Materials and Web Links:*

1. G.W.Dawson and B.W.Mercer , Hazardous Waste Management, Academic Press, Inc., London, England
2. H.M.Freeman, Standard Handbook of Hazardous Waste Treatment and Disposal, McGraw-Hill, Inc., New York
3. E.J.Martin and J.H.Johnson, Jr., Hazardous Waste Management Engineering, Van Nostrand Reinhold Co. Inc. New York.

**Syllabus Description:** Generation, storage, transportation, treatment, disposal, exchanges and minimization of hazardous waste. Classification, categories of hazardous waste. Hazardous waste (management and handling) rules. Secured landfilling.

**Prerequisites/Co-Requisites:** No prerequisite

**Course Role in Curriculum:** Elective

#### **Course Objectives:**

1. To introduce hazardous waste materials.
2. Teach about the generation, classification and categories and sources of hazardous waste.
3. Teach about the methods of treatment and management of hazardous waste.
4. Various rules about the management and handling of hazardous waste.

#### **Course Outcomes:**

At the completion of this course, the student should be able to:

5. Gain a broad knowledge about the hazardous waste
6. Understand sources and classification of hazardous waste.
7. Waste minimization technics
8. Management of hazardous waste
9. Various rules and regulations for the management and handling of hazardous waste

**[ Student Outcomes : a,b,c,d, e, h ]**

**Course Topics:**

Generation, storage, transportation, treatment, disposal, exchanges and minimization, legislative and technical aspects, current management practices; Environmental audits, pollution prevention, facility development and operations, treatment and disposal methods; physical, chemical, thermal, biological processes, land disposal with general applications to the industrial and energy-producing sectors, Site remediation. Special wastes, such as, infectious and radioactive waste.

**CEL 441 – Geotechnical Aspects for Design of Machine Foundation****Credit Hours:** 3 (Even Semester)**Contact:** 3 Hrs lectures per week,**Instructor:** Dr. Anirban Mandal**Textbooks and Other Materials:**

*Required: Geotechnical Earthquake Engineering, Auth. Kramar S.L pub. Prentice Hall International series, Pearson Education. § Dynamics Soil Tests and Applications, Kameswara Rao, Wheeler Publishing, New Delhi and Web Links: as provided at the course Blackboard site*

**Syllabus Description:** Introduction, vibration of a system, Different mode of vibration, Relevant soil parameters, Wave propagation and Instrumentations.

**Prerequisites/Co-Requisites:** Soil Mechanics**Course Role in Curriculum:** ~~Core~~/ Elective Course**Course Objectives:**

1. Introduction to vibration of a system.
2. Concept of different mode of vibration.
3. Physical significance of wave propagation theory.
4. Relevant soil parameters and Instrumentation.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain a broad understanding of Vibration of a system.
2. Get accustoms with mode of vibration and wave propagation concept.
3. Knowledge of different instruments and relevant soil parameters for design of foundation.
4. Contemporary issues and developments.

**[Student Outcomes: a, b, e, j]****Course Topics:**

Introduction to vibration, Different mode of vibration, Development the concept of wave propagation, relevant soil parameters, Instrumentation and Design of foundation for dynamic loads, Tutorial for real type problem.

**CEL 442 – Geotechnical Investigation for Construction Projects****Credits:** 6 (Odd Semester)**Contact:** 3 Hrs lectures per week**Instructor:** Dr. Anjan Patel

**Textbooks and Other Materials:***Required:*

- Ground Improvement Technique, Purushothama Raj, Laxmi publication.
- Ground Improvement, Michael P. Moseley, Klaus Kirsch, CRC Press, 2001.
- Site Investigation, C.R.I. Cyayton, M.C. Matthews and N.E. Simons, 2<sup>nd</sup> Edition.
- Ground and Soil Improvement, C. Raison and C A Raison, Thomas Telford Publishing, 2004
- Related articles from Quarterly Journal of Engineering Geology.
- *Supplemental Materials and Web Links:* as provided at the course Blackboard site. Related IS, BIS and ASTM Codes.

**Syllabus Description:** Site investigations; field testing in soils and rocks; Sampling, preservation and transportation to laboratory; drilling methods; Preparation of borelogs and trial pit logging; Geotechnical proposal, specification and report writing; Soil stabilization and ground improvement techniques; Studies of Case histories; Forensic Geotechnical Engineering

**Prerequisites/Co-Requisites:** Basic Soil Mechanics and Foundation Engineering

**Course Role in Curriculum:** Elective

**Course Objectives:**

4. To make the students capable of solving real problems related to Geotechnical engineering, once he/she join industries as a fresh geotechnical engineer.
5. In this course all the topics will be taught from the application point of view with examples from case histories and a student will get a chance to apply his theoretical knowledge to solve real geotechnical challenges.
6. Introduction with advance methodology, techniques and tools related to geotechnical investigation
7. To discuss ground improvement with various methodologies.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Write geotechnical proposal, specification and reports
2. Bore logging and trialpit logging
3. Supervise field and lab testings of soil and rocks
4. Collect and analyze geotechnical data for various construct projects
5. Analyse and suggest proper ground improvement technique for problematic ground conditions

**[Student Outcomes: a, b, c, e, f, j]**

**Course Topics:**

1. Geotechnical Site investigations
2. Field testing in soils and rocks
3. Sampling, preservation and transportation of soils and rocks to laboratory
4. Drilling methods
5. Preparation of borelogs and trial pit logging
6. Geotechnical proposal, specification and report writing
7. Soil stabilization and ground improvement techniques
8. Studies of Case histories
9. Forensic Geotechnical Engineering

**CEL 424 – Environmental Studies****Credit Hours:** 3 (Odd Semester)**Contact:** 3 Hrs lectures per week,**Instructor:** Dr. M. V. Latkar and Dr. Shilpa Dongre**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars**Textbooks and Other Materials:***Required:* 1. Environmental Studies by J. P. Sharma, 3rd Edn., University Science Press.

2. Environmental studies- from crisis to cure by R. Rajagopalan, Oxford University Press

*Supplemental Materials and Web Links:* as provided at the course Blackboard site**Syllabus Description:** Importance and status of natural resources. Concept of ecosystem. Biodiversity and its conservation. Environmental pollution. Social issues and environment. Human population and environment.**Prerequisites/Co-Requisites:** Nil**Course Role in Curriculum:** Elective Course (DE and OC)**Course Objectives:**

1. Introduce to various natural resources, their importance and status.
2. Introduce to the concepts of ecosystem, their structure and functions.
3. Introduce to the concept of biodiversity conservation.
4. Introduce to possible causes of various forms of environmental pollution and their consequences, methods of prevention.
5. Introduce to various social and climatic changes due to pollution.

**Course Outcomes:**

At the completion of this course, the student should be able to:

1. Gain a broad understanding of effect of human activities on natural environment,
2. Develop the responsibility of conservation of natural resources for sustainable development,
3. Understand the mitigation measures for preventing environmental disasters,
4. Develop the sense of biodiversity conservation,
5. Develop the understanding of eco-friendly designs for engineering applications,
6. Contemporary issues and developments.

**[Student Outcomes: c, d, f, h, j]****Course Topics:**

Natural resources: Forest, Water, Mineral, Food, Energy and Land resources.

Ecosystem: concept, structure and functions. ecological succession, food chain and food webs. Biodiversity and its conservation.

Environmental pollution: causes, effects and control measures of various types of pollutions. Solid waste management: causes, effects and control measures of urban and industrial wastes.

Social issues and environment: sustainable development, water conservation, rain water harvesting, watershed management, climate change, global warming, acid rain,

ozone layer depletion etc.  
Environmental rules & regulations.  
Human population and environment.

**CEL 430 Computer Aided Analysis and Design**

**Credit Hours: 3+1 (Summer)**

**Contact: 3 Hrs lectures+2 Hrs. Laboratory per week**

**Instructor: Dr. Rahul V Ralegaonkar**

**Textbooks & other materials:**

1. Vijay duggal Caad primer, a general guide to computer aided design and drafting
2. D F Rogers & J A Adams Mathematical Elements of Computer Graphics. Tata McGraw-Hill Publishing Company
3. E V Kameshwar Numerical Techniques in 'C' BPB Publication.

**Syllabus description:** The course includes the multidisciplinary concept of computer applications in civil engineering. The course also includes development and use of software tools for analyzing civil engineering problems.

**Prerequisites/Co-requisites: -**

**Course role in curriculum:** Elective Course

**Course Objectives:**

1. To introduce the students about the application tool useful for civil engineering.
2. To make students aware about techniques and programming aids which can be implemented for solving the problem of civil engineering?
3. To make students self efficient to solve the challenges with the aid of technological aids.

**Course outcomes:**

At the completion of this course, students would be able to

5. gain a broad understanding of IT in civil engineering.
6. identify, formulate, and solve engineering problems
7. contemporary issues and development
8. use the techniques, skills, and modern engineering tools necessary for engineering practice.

**[Student Outcomes: a,e,j,k]**

**Course Topics:**

Introduction to CAAD and computer graphics: Overview, programming language, application area, software environment. Data types, graphics devices, representation of images, transformations, computer aided drafting

Programming language and techniques: overview, variables & datatypes, operators, input-output, control structures, functions, arrays, pointers, strings, data-files, trees, recursion.

Database management system (DMBS): Introduction, Components of DBMS, Data Models, query language, design of database

Knowledge based expert system: Introduction, Artificial intelligence, components of expert system, knowledge representation, inference mechanism, building expert system

Simulation: Introduction, Concept of System, models & its purpose, types, approaches

Analytical Tools: Introduction & application of Finite Element Method, Optimization, Genetic Algorithm, Fuzzy Logic. Application of IT aides for Civil Engineering Applications like Building Technology and Construction Management

## **CEL 464 – Financial & Business Management**

**Credits : 6** (Even Semester)

**Contact : 3 Hrs** lectures per week

**Instructor : A. G. Tawalare**

**Course Assessment Method:** Two Sessionals, End Sem Exam, Assignments and Seminars

### **Textbooks and Other Materials :**

*Required :* Essentials of Management by Koontz O'Donnel, Edition 1992, Tata McGraw Hill.

*Supplemental Material :* Managerial Economics by Peterson H.C. & Lewis W.C., Edition 2001, Prentice Hall of India Ltd.; Personnel Management by Moappa A., Edition 2002, Tata McGraw Hill.

**Syllabus Description :** Principles of management, economic environment of business, Role of Manager, HR management, marketing principles & strategy, materials management, financial management

**Prerequisites:** Nil

**Course Role in Curriculum:** Elective Course

### **Course Objectives:**

1. To understand the principles of management
2. To understand the terminology in finance & accounting
3. To understand the principles of HR management
4. To understand the marketing principles & strategy
5. To understand the basics of materials management

**Course Outcomes:** At the completion of this course, the student will be able to

1. analyse the management system of the organisation
2. understand the role of manager and skills required
3. use the swot analysis in decision making
4. understand the terminology in marketing, HR, finance, Accounting
5. apply knowledge in industry for effective management

[ **Student Outcomes : c, d, f, h, i** ]

### **Course Topics:**

Principles of management & personnel management  
Role of manager, task & responsibilities  
Organisation structure  
Human Resource development system  
SWOT analysis



Basics of consumer behaviours  
Marketing principles, planning and strategy  
Pricing & promotion strategy  
Accounting terminology  
Types of Taxes  
Financial Management  
Principles of materials management  
Concept of TQM

**CEL 554-Project Appraisal & Construction Finance Credits 6**

**Credit Hours:** 3 ( Odd Semester)

**Contact:** 3 Hrslectures per week,

**Instructor:** Prof. S.P.Wanjari

**Textbooks and Other Materials:**

1. I. M Pandey, Financial Management, Vikas Publishing house pvt ltd<sup>9</sup><sup>th</sup> Edition.
2. Frank Harris & Ronald McCafferModern Construction ManagementBlackwell science<sup>4</sup><sup>th</sup> Edition.
3. Roy PilcherPrinciples of Construction Management, McGraw Hill London.
4. United Nations Guidelines for Project Evaluation Oxford &IBH Publishing Co. Pvt. Ltd.
5. A.H. Taylor & H Shearing, Financial & Cost Accounting for Management Mac Donald & Evans Ltd, London <sup>8</sup><sup>th</sup>.

**Syllabus Description:**

Project Appraisal : Project appraisal, government and private project evaluators, significance of social benefit cost analysis, commercial profitability, national economic profitability, measurement of direct and indirect benefit and costs. Calculation of benefit cost ratio.

Engineering economics - Time value of money, discounted cash flow, decision making among the alternatives, replacement analysis, break even analysis.

Project capital: Cash flow of a project, estimation of minimum capital required, internal rate of return (IRR), Multiple IRR, estimation of annualized cost.

Depreciation : importance, classification, types – straight line, sum of year method, double rate declining balance method

Capital Budgeting: element of budgeting – men, materials, equipments, overhead, profits – preparation of capital budget.

Performance statement: capital gearing ratio, shares, debentures, PBT, PAT, PBIT, Earning per share, preparation of company's performance statement, Inflation.

**Prerequisites/Co-Requisites:** Project Planning and Management

**Course Role in Curriculum:** departmental Course

**Course Objectives:**

1. Importance of Time Value of Money in Construction Management Scenario
2. Economic evaluation of Govt. Projects., Benefit cost ratio
3. Preparation of Site Accounting statement.
4. Capital budgeting of Construction Project.
5. Depreciation, Performance statement of Company
6. Job cost Report of a Project
7. Understanding ROCE, EVA from the Finance Statement

**Course Outcomes:**

At the completion of this course, the student should be able to:

7. Preparation of a Budget requirement of the Project

8. Monthly Planning of Financing of a project.
9. Determine Benefit cost ratio.
10. Determine Economic life of the Equipment's.
11. Can prepare a Job cost report of running project.
12. Can estimate Return on Cost Employed (ROCE) and Economic Value Addition (EVA)

[ **Student Outcomes : c, d, f, h, i** ]

**Course Topics:**

Time value of Money.

Benefit Cost Ratio

Capital Budgeting

Economic Life of Equipment

Depreciation

Performance Statement

Accounting statement

## APPENDIX II

## STUDENTS FEED BACK FORM

The form which you are about to fill up , has been designed with the prime objective of making our educational system more effective and more adaptable for you to achieve excellence. This exercise is meant to collect you opinion of different facets of education being imparted in this department. Please base your judgment on your honest and unbiased observation. Your balanced and matured opinion will assist in achieving the desired objectives. Answer independently, objectively and with a sense of responsibility.

Please bear in mind that your response will in no way affect your results. Hence you may write your names , though it is not mandatory. This exercise of collecting feedback from you will be utilized in improving the process education. Remember that is abuse or misuse may shatter its shatter its very purpose and prevent improvement in our education systems.

Name of the Student (Optional ):

\_\_\_\_\_

Class Roll No. (Optional ) : \_\_\_\_\_ Sem/Course:

\_\_\_\_\_ Session: 20-20

Please fill in the points (rating from 1 to 10) as per your opinion for each of the subject below.

Sr. No	Creation	Points	1-10	1-10	1-10	1-10	1-10	1-10
		Teachers Names						
		Subject Names						
1.	Were the course ideas presented clearly ? (1:Not all ..... 10: always So)							
2.	Was the class room delivery audible and understandable? (1:Not all ..... 10: always So)							

3.	Were classes conducted regularly and punctually ? (1:Not all ..... 10: always So)							
4.	Was proper pace of teaching maintained ? (1:Not all ..... 10: always So)							
5.	General interaction of instructor with students . (1:Very poor ..... 10: Excellent)							
6.	Were opportunities provided for question and discussion? (1:Never ..... 10: Always)							
7.	Were questions answered satisfactorily ? (1:Never ..... 10: Always)							
8.	Were test papers discussed in the class after the test? (1:Never ..... 10: Always)							
9.	Were test papers discussed in the class after the test ? (1:Never ..... 10: Always)							
10.	Was a course outline provided at the beginning? (1:Not at all ..... 10: clearly provided)							

**PART-A (Teachers Feedback)**

**Part - B (Course Evaluation)**

1.	Did the course deepen your interest in the subject ? (1:Not at all ..... 10: defined yes)							
2.	Are sufficient number of reference books related to the course available in the library ? (1: Boring ..... 10: very exciting)							
3.	How did you find the course ? (1: Boring ..... 10: very exciting)							
4.	Did you work out numerical /home assignments regularly? (1:Never ..... 10: Always)							
5.	We manuals /data sheets, write-ups etc available in the labs? (1:Not at all .....10: Always)							
6.	Was lab equipment functional while you were experimenting? (1:Not at all .....10: Always)							
7.	Are the lab facilities adequate? (1:Not at all .....10: Always)							
8.	Were you given proper assistance in the lab? (1:Not at all .....10: Always)							
9.	Are the labs kept clean ? (1:Not all .....10:Always)							
10.	Were sufficient numbers of practical conducted to illustrate important topics of the course content ? (1:Not all .....10:Always)							

Any other comments/Suggestion based on : (a) What you liked most about the course, (b) What you liked least, (c) What you think can be done to improve the course inputs by the teachers :

For part A Your Comments about the teacher:

\_\_\_\_\_

\_\_\_\_\_

For Part B Your Comments about the course:

\_\_\_\_\_

\_\_\_\_\_

Signature &Name of the student (optional)