NATIONAL BOARD OF ACCREDITATION

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

ELECTRICAL ENGINEERING DEPARTMENT

NATIONAL BOARD OF **ACCREDITATION**

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(January, 2013)

Contents

Self Assessment Report (SAR)
Part A
1. Institutional Information

1.1. **Name and address of the institution and affiliating university:**
VISVESVARAYA NATIONAL INSTITUTE OF TECHNOLOGY (VNIT),
SOUTH AMBAZARI ROAD, NAGPUR 440010

1.2. **Name, designation, telephone number, and e-mail address of the contact person for the NBA:**
Dr. Narendra S. Chaudhari, Director VNIT.
Ph : 0712-2801363
Email : director@vnit.ac.in

Dr. K D Kulat, Professor, Department of Electronics Engineering
Ph : 0712-2801345
Email : kdkulat@ece.vnit.ac.in / kishor_kulat@yahoo.com

1.3. 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 15th August 2007. VNIT Nagpur was conferred the Deemed to be University status (under University Grants Commission Act, 1956 (3 of 1956)) with effect from 26th 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, Nagpur is the 13th most populous city and 13th largest urban agglomeration in

India. It is the 154th largest agglomeration and 164th 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. 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 19th 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" 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 in the city. It s 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 21^0, 7' 28",E 79^0, 3' 8". The official website address for VNIT is: *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 18 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., 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, Excavation Engineering, Chemical Engineering and Urban Planning. The Institute also offers M.Tech. by research program in all engineering departments, Ph D (Full/Part Time). Institute has stared 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
Under Graduate Program : B. Arch/B. Tech.			
01.	Architecture	1960	62
02	Chemical Engineering	2006	92
03.	Civil Engineering	1960	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.	Metallurgical and Materials Engineering	1965	92
09.	Mining Engineering	1982	40
	TOTAL		**738**
Post Graduate & Research Programs : M. Tech.			
01.	Environmental Engineering	1966	26
02.	Water Resources Engineering	2011	22
03.	Construction Technology and Management	2010	22
04.	Transportation Engineering	2012	22
05.	VLSI Design	2007	26
06.	Communication System Engineering	2012	26
07.	Computer Science Engineering	2007	24
08.	Industrial Engineering	1989	23
09.	Heat Power Engineering	2002	23
10.	CAD-CAM	2007	23
11.	Integrated Power System	1968	25
12.	Power Electronics & Drives	2010	25
13.	Materials Engineering	2005	22
14.	Structural Dynamics and Earthquake Engineering	2003	22
15.	Structural Engineering	1991	25
16.	Excavation Engineering	2012	20
17.	Urban Planning	1988	22
18.	Chemical Engineering	2015	24
	TOTAL		**422**
M Sc.			
01.	M Sc Chemistry	2013	20
02.	M Sc Mathematics	2013	20

03.	M Sc Physics	2013	20
	TOTAL		**60**

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 2nd 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
01.	B.Tech. Electronics & Comm. Engg.	Accredited	5 years
02.	B.Tech. Mechanical Engg.	Accredited	2 years
03.	B.Tech. Civil Engg.	Accredited	5 years
04.	B.Tech. Computer Science & Engg.	Accredited	2 years
	B.Tech. Chemical Engg.	Accredited	2 years
05.	B.Tech. Mining Engg.	Accredited	5 years
06.	B.Tech. Metallurgical & Materials Engg.	Accredited	5 years
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. Computer Science & Engg.	Accredited	5 years
15.	M.Tech. Structural Engineering	Accredited	5 years
16.	M.Tech. Integrated Power System	Accredited	2 years
17.	M.Tech. Materials Engineering	Accredited	5 years
18.	M.Tech. Environmental Engineering	Accredited	2 years
19.	M.Tech. Ferrous Process Metallurgy	WITHDRAWN	
20.	M.Tech. Ferrous Process Metallurgy	WITHDRAWN	

(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
04	Construction Technology and Management	20
05	Excavation Engineering (2012)	20
06	Chemical Engineering (2015)	20
	Total Increased Intake	**120**

Institute has following ranked in various ranking surveys 2015:

- 11th Best Engineering Institute in India and the first among NITs in i3RC Times Engineering survey.
- 14th Top Engineering College in India and 2nd in Western India as per EDU-RAND rank.
- 25th Top Engineering College in India and 3rd in Western India as per digital LEARNING India.
- 27th Top Engineering College in India as per Outlook magazine.

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; ,l ,

- 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, Volley Ball, 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 (29 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.

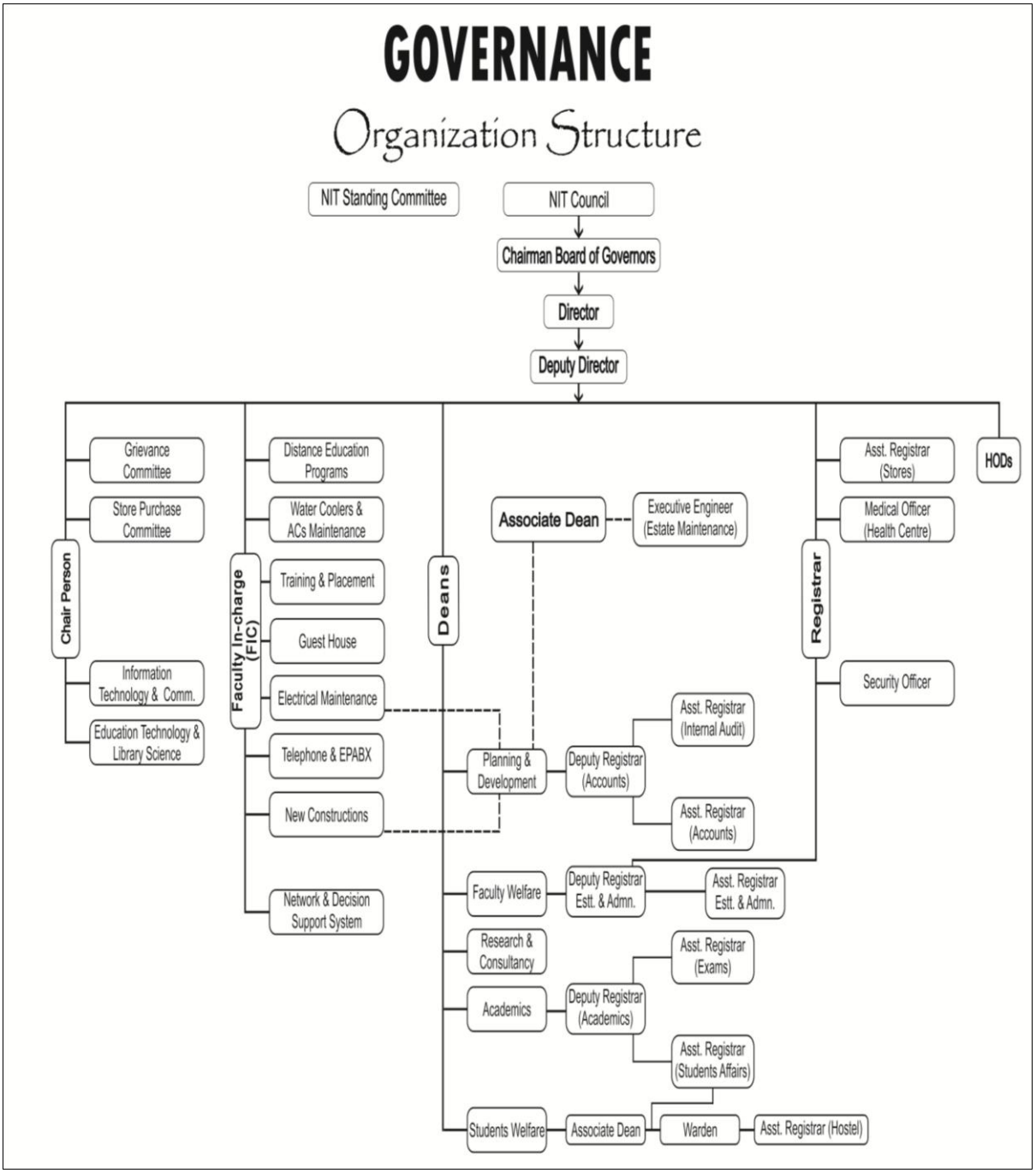
1.6. Organisational Structure:

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.

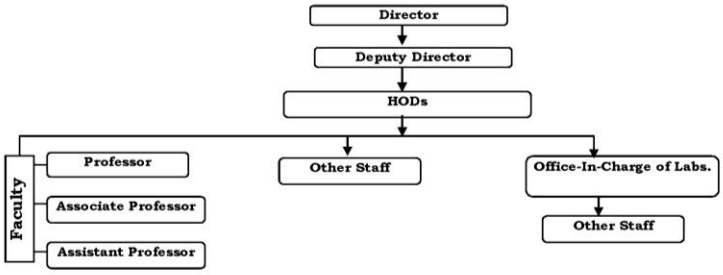
1.6.2 Flow Chart showing Institutional Administration



1.6.3 Flow Chart showing the hierarchy of Academic Departments

Figure - 2

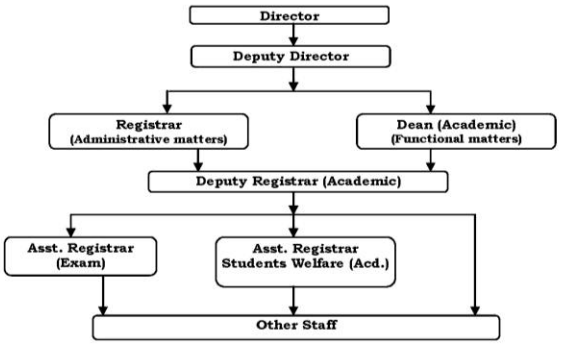
1. ACADEMIC DEPARTMENTS



	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)

1.7. 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)

1.8. 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	-	-

1.9. **External sources of funds**: (Rs. in Lacs)

Name of the External Source	CFY 2015-16	CFY 2014-15	2zCFY 2013-14
Plan	**4487.84**	**7207.29**	**8730.90**
Non Plan	**5720.71**	**6460.53**	**4441.53**

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

1.10 Internally acquired funds: (In Rupees)

Name of the Internall Source	CFY 2015-16 (as on 31 Dec. 2015)	CFY 2014-15	CFY 2013-14
Students' fee	**3056.44**	**2536.51**	**1614.58**
Interest & Other Income	**1189.56**	**752.54**	**486.44**

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

1.11 Scholarships or any other financial assistance provided to students?

VNIT Nagpur is making available to it's 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 2015-16	CFY 2014-15	CFY 2013-14	CFY 2012-13	CFY 2011-12	CFY 2010-11
Scholarship Assistance	Various sources given in **1.11**					
Amount	**407.32**	**234.49**	**328.06**	**174.86**	**177.64**	**237.27**

1.12 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.)

1.13 Total number of engineering students:

	CFY 2015-16	CFY 2014-15	CFY 2013-14	CFY 2012-13	CFYm1 2011-12	CFYm2 2010-11	CFYm3 2009-10
Total no. of boys	3099	3235	3199	2868	2636	2398	2142
Total no. of girls	1154	1052	918	708	583	500	457
Total no. of students	4253	4287	4117	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.)

1.14 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 2015-16		CAY 2014-15		CAY 2013-14		CAY 2012-13		CAY 2011-12		CAY 2010-11	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Teaching staff in engineering	M		133		118		131		122		123		119
	F		25		34		23		20		20		19
Teaching staff in sciences & humanities	M		23		24		24		15		17		16
	F		9		10		7		7		7		7
Sports Activity Center	M		2		2		2		-		-		-
Non teaching staff	M		163		160		9		10		10		
	F		39		39		3		3		3		3

B. Contract Staff

Items	GENDER	CAY 2015-16		CAY 2014-15		CAYm1 2013-14		CAYM2 2012-13		CAYM3 2011-12		CAYM4 2010-11	
		Min	Max	Min	Max	Min	Min	Max	Max	Min	Max	Min	Max
Teaching staff in engineering	M		13		19		01		01		02		00
	F		5		13		00		00		00		00
Teaching	M		5		5		01		00		00		00

staff in sciences & humanities	F		3		3		00		00		00		00
Non teaching staff	M		59		45		73		75		77		76
	F		36		32		19		19		19		19

II. Departmental Information

II.1. Name and address of the department:

Electrical 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. S. R. Bhide
Professor
Telephone No. 0712-2801349, 9373102198
srbhide@eee.vnit.ac.in, srbhide@gmail.com
Dr. B. S. Umre
Associate Professor
Telephone No. 07122801122, 9423102827
bsumre@eee.vnit.ac.in, bsumre@rediffmail.com

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:

Programme	Description
UG in **Electrical and Electronics Engineering**	Started with 60 seats in 1960 Intake increased to 92 in 2010
PG in	**1. Integrated Power Systems (IPS) (Since 1968)** **2. Power Electronics and Drives (PED)(Since 2010)**

II.4. Mission and Vision of the Department

VISION:

The Department of Electrical Engineering will provide programs of the highest quality to produce globally competent technocrats who can address challenges of the millennium to achieve sustainable socio-economic development.

MISSION:

The mission of the Electrical Engineering Department is:

1. To create graduates possessing sound ***fundamental knowledge*** of Electrical Engineering

2. To ***provide technocrats*** for industries
3. To pursue ***research*** in Electrical Engineering and across the disciplines
4. To create engineering manpower for contributing effectively towards ***societal development***

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.)

Sr. No.	Name of the Programme	Human resource Share in %	Facilities (Laboratory/Library/Internet)share in %
1.	UG (EEE)	60	70
2.	PG (IPS)	20	15
3.	PG (PED)	20	15

II.6. Total number of students:

UG: 98 (14-15) Admission to First Year, (Including DASA)

UG: 95 (13-14) Admission to First Year, (Including DASA)

UG: 100 (12-13) Admission to First Year, (Including DASA)

PG: 40 (IPS), 40 (PED)

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 (14-15)		CAYm1(13-14)		CAYm2(12-13)		CAYm2(11-12)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Teaching staff in the department	20	22	20	20	19	19	18	18
Non-teaching staff	09	09	08	09	07	08	08	09
Total	29	31	28	29	26	27	26	27

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

Items	**Budgeted in 2014-15 in INR**	**Actual expenses in 2014-15 in INR**
Laboratory equipment	20,00,000(plan) +75,00,000(TEQIP) + 30,00,000(FIST)	1,53,42,835
Software		

Laboratory consumable	4,00,000 (DOE) (Departmental Operating Expenses)	39,331
Maintenance and spares		3,24,498
Training and Travel		24,538
Miscellaneous expenses for academic activities		6,61,318
Total	**1,29,00,000/-**	**1,63,92,520**

Items	**Budgeted in 2013-14 in INR**	**Actual expenses in 2013-14 in INR**	**Budgeted in 2012-13 in INR**	**Actual expenses in 2012-13 in INR**
Laboratory equipment	90,00,000	54,74,752	50,00,000	29,59,363
Software		12,50,455		2,6,250
Laboratory consumable	4,00,000 (DOE)	1,21,021	3,00,000 (DOE)	1,27,520
Maintenance and spares		1,55,271		44,591
Training and Travel		13,004		65,222
Miscellaneous expenses for academic activities		4,94,543		1,39,334
Total	**94,00,000**	**75,09,096**	**53,00,000**	**33,62,280**

** 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 Institutional Income Expenditure statement in Part I - item I-10.*

III. Programme Specific information

III.1. Name of the Programme

UG in **Electrical and Electronics Engineering**

III.2. Title of the Degree: **B. Tech., Electrical and Electronics Engineering**

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

Programme coordinator for the NBA:

Dr. S. R. Bhide
Professor
Telephone No. 0712-2801349, 9373102198
srbhide@eee.vnit.ac.in, srbhide@gmail.com
Dr. B. S. Umre
Associate Professor
Telephone No. 07122801122, 9423102827
bsumre@eee.vnit.ac.in, bsumre@rediffmail.com

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

Program	Description
UG in **Electrical and Electronics Engineering**	Started with 60 seats (1960). Intake increases to 92 in 2010-11 **Accredited in 10.02.2009 (for 5 years)**

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 Ph. D. degrees.
4. Although faculty is encouraged to register for Ph. D., 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 Ph. D. produced and no of publications are not good enough for an NIT.

Action taken against the previous mentioned deficiencies and weaknesses:

1. Statutes have now been approved. (Letter no. F.22 – 5/2006 – TS.III(Pt.), GoI, Shastri Bhawan, New Delhi, the 11th May, 2009
2. New hostels are constructed for M.Tech. and Ph. D. students.
   Hostel No. 4 and 5 - For M.Tech.
   Multistoried Building - For Ph. D. scholars
3. Now 91 % of faculty members are having Ph. D.
4. Faculty members are encouraged to avail QIP facility to pursue their PhD outside VNIT.
   PG intake increased from 13 to 20.
   There is substantially increase in Ph. D. research scholars (Presently registered students – **63**).
5. A good number of junior faculty members have been able to publish their papers in reputed journals because of increase in PhD candidates being guided by junior faculty members.

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

UG 2nd year: 98

UG 3rd year: 95

UG 4th year: 100

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 (14-15)		CAYm1(13-14)		CAYm2(12-13)		CAYm2(11-12)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Teaching staff **in the programme**	17	22	17	20	16	19	15	18
Non-teaching staff	09	09	08	09	07	08	08	09
Total	26	31	25	29	23	27	23	27

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	**Budgeted in 2014-15 in INR**	**Actual expenses in 2014-15 in INR**
Laboratory equipment	10,00,000 (plan) +37,50,000 (TEQIP) + 15,00,000(FIST)	76,71,418
Software		
Laboratory consumable	2,00,000 (DOE) (Departmental Operating Expenses)	19,666
Maintenance and spares		1,62,249
Training and Travel		12,269
Miscellaneous expenses for academic activities		3,30,659
Total	**64,50,000/-**	**81,96,261**

Items	Budgeted in **2013-14** in INR	Actual expenses in **2013-14** in INR	Budgeted in **2012-13** in INR	Actual expenses in **2012-13** in INR
Laboratory equipment	45,00,000	27,37,376	25,00,000	14,79,682
Software		6,25,228		13,126

Laboratory consumable	2,00,000 (DOE)	60,511	1,50,000 (DOE)	63,760
Maintenance and spares		77,636		22,296
Training and Travel		6,502		32,611
Miscellaneous expenses for academic activities		2,47,273		69,667
Total	**47,00,000**	**37,54,525**	**26,50,000**	**16,81,142**

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)

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

Vision and Mission of the <u>INSTITUTE</u>:

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.

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 and Mission of the <u>DEPARTMENT</u>:

VISION:

The Department of Electrical Engineering will provide programs of the highest quality to produce globally competent technocrats who can address challenges of the millennium to achieve sustainable socio-economic development.

MISSION:

The mission of the Electrical Engineering Department is:

1. To create graduates possessing sound ***fundamental knowledge*** of Electrical Engineering
2. To provide technocrats for industries
3. To pursue ***research*** in Electrical Engineering and across the disciplines
4. To create engineering manpower for contributing effectively towards ***societal development***

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

The display of vision and mission are at following locations through the banners, display boards.

1. Head of the Department's Office
2. Departmental corridors
3. Classrooms / Laboratories
4. Departmental Brochure
5. Institute website/Departmental web page

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

The vision and mission are framed keeping in mind the following points

1. Needs of industry.
2. Requirements of academia
3. Aspirations of the student community
4. Expectations of the society
5. Vision and mission of the institute
6. Policies of the Central Government and MHRD
7. Objective of education is to inculcate the virtues of truth, justice and nonviolence for healthy mind.

1.2. Programme Educational Objectives (15)

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

The main **Programme Educational Objectives** of UG program are

1. To facilitate students for pursuing ***higher studies***.
2. To empower graduates to cope up with ***constantly evolving technology*** through lifelong learning.
3. To enable graduates for successful ***technical/professional career***.
4. To sensitize towards environmental issues by inculcating the importance of ***green technology***.

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

The display of PEOs is at following locations;

1. Departmental Brochure
2. Department Notice Board
3. Institute website/Departmental web page
4. Classrooms and laboratories

1.2.3. List the stakeholders of the programme (1)

Major stakeholders of this programme are:

1. Students
2. Parents and Society
3. Industries such as: BHEL, ONGC, NTPC, IOCL, and local industries etc.
4. Power utilities: PGCIL, MSEDCL, etc.
5. Research Organisations such as: CSIR, BARC, CPRI, BHEL R&D, ERDA, GE, etc.
6. Academia

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

1. Academic activities – lectures, lab experiments, projects, seminars, industrial visits and deputation for conferences / workshops
2. Monthly departmental meeting
3. Mentor meeting for quality improvement
4. Participation of student committee and its feedback
5. Peer review of the departmental academic activity

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

PEOs	**Mission**			
	Fundamental knowledge M1	***Technocrats for industries M2***	***Research M3***	***Societal development M4***
1. Higher studies (PEO1)	3	2	3	1
2. Constantly evolving Technology (PEO2)	3	2	3	2
3.Technical/ professional career (PEO3)	3	3	1	2
4. Green technology (PEO4)	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Justification:

1. PEO1 – M1: For higher studies; fundamental knowledge is a must.
2. PEO1 – M2: Entry level for industry is graduation.
3. PEO1 – M3: Research demands higher studies.
4. PEO1 – M4: Persons contributing to societal development are usually found to branch out early in their career.

1. PEO2 – M1: Without sound fundamental knowledge technological growth is seldom possible.
2. PEO2 – M2: Technocrats have to keep pace with constantly evolving technology.
3. PEO2 – M3: Research and state of art technology go hand in hand.
4. PEO2 – M4: Society may be slower in adopting the emerging technology.

1. PEO3 – M1: Fundamental knowledge is the backbone of all technical activities.
2. PEO3 – M2: Successful technical career is the key for progressive industries.
3. PEO3 – M3: For majority of technical graduates research is not the career path.
4. PEO3 – M4: Some graduates follow a career path of societal development.

1. PEO4 – M1: Challenges posed by green technology demands repeated application of fundamentals.
2. PEO4 – M2: To earn carbon credits technocrats have to adopt green technology.
3. PEO4 – M3: Bringing to fruition green technology demands continuous research.
4. PEO4 – M4: For environmental friendly societal development use of green technology is a must.

1.3. Achievement of Programme Educational Objectives (30)

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

- The broad curriculum is based on making students understand **Basic Electrical Engineering** and its Applications through the subjects like Network Theory, Electrical Machines, Control System, Measurements, Power System, Linear and Digital Electronic Circuits, Power Electronics, Microprocessor etc.
- The students are induced to engage in analytical thinking by setting challenging questions in various examinations viz. **two sessionals and one end semester exam.**
- **Assignments, quizzes and seminars** further contribute towards development of **analytical skills.**
- During their final year, students are required to undertake **projects** based on software / Hardware.
- In addition to regular **practical sessions,** they benefit from **expert talks / guest lectures, and industrial visits.**
- The **industry institute interaction** helps to build students confidence in their problem solving abilities.

- To improve sensitivity and building awareness among the students towards environmental issues subjects like **green chemistry, renewable energy sources and energy conservation and audit** have been added to the curriculum.

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

- The **student class committee** meets twice in each semester and their views are incorporated in order to improve the curriculum.
- The **student class committee** meetings results in pointing out deficiencies in the teaching and learning process which helps in improving the overall quality of manpower being produced.
- Under-performing students are identified by the above process towards whom special attention is directed by various mechanisms like **student mentor, faculty mentor and faculty advisor**.
- The curriculum improvement, modifications, and additions are governed by **Board of Studies (BOS)**.
- Academic modifications /alternations are approved by **SENATE.**
- 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 scheme of examination and award of the degree is followed as per the rules set by the **Dean (Academics)** and approved by senate.
- Major administrative policies are implemented by the department as per the directives of BOG.

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) Assessment tools

1. Feedback from academic committee and deliberation in the BOS.
2. Guidelines and approval from Senate as and when obtained.
3. The feedback from Training and Placement once in a year.
4. The feedback from student class committees, four times per year.
5. Suggestions received time to time from industrial experts.
6. The continuous academic quality assessment is carried out through a peer (external) review process once in a year.

B) Assessment process

1. Every semester by conducting the scheduled meeting of class committee, academic committee and administrative committee.
2. Random sample assessment by inviting experts and section of stakeholders.
3. Monthly departmental meeting.

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

a) The expected level of attainment for each of the programme educational objectives is 90%.
b) This evaluation is based on the placement of the students in the industries and academia.
c) The list is as under

Placement details of students : **2014-15**

Sr. No.	Name of the Student	Selected in Normal Company	Selected in Dream Company
1.	Abhishek Kumar Sahu	L & T ECC	Coal India
2.	Akshay Shrivastava		Johnson & Johnson
3.	Aman Rajput	L & T ECC	Coal India
4.	Amey Anil Patil	JSW	
5.	Amey Dipak Khot	Tata Power	
6.	Apoorv Puranik	Tata Motors	
7.	Karse Apurwa Dilip	Ginger Webs Pvt. Ltd.	Coal India
8.	Avinash Patro	L & T ECC	
9.	Bagade Gaurav Wasudeo	L & T ECC	Fractal Analytics
10.	Shubhank Tejram Bhandarkar	L & T Powai	Fractal Analytics
11.	Yash Mohan Bhatt	JSW	
12.	Pooja Satish Bhopale	Crompton Greaves Ltd.	
13.	Sumit Bhurewar	L & T ECC	
14.	Chavan Om Shivlal	SMS Infrastructure Ltd.	
15.	Chopda Yogin Shripal	Principal Global Services Pvt.Ltd.	Fractal Analytics
16.	Deepak Verma	SMS Infrastructure Ltd.	
17.	Pundlik Gaurav	L & T Powai	

	Girish		
18.	Gundekar Shubham Dhondopant	VA TECH WABAG LTD	
19.	Arup Rabindranath Hazra	Reliance Industries Limited	
20.	Ingle Anoop Atish		
21.	Aarti Vinod Jain	EXL Decision Analytics	HUL
22.	Jawale Jayesh Sudhir	Reliance Industries Limited	
23.	Vikhar Ketki Manohar		Coal India
24.	Kompella Shreyaan	L & T ECC	
25.	Kuchana Bhaskar	L & T ECC	
26.	Kulkarni Apeksha Ambadas	SHV Energy Pvt. Ltd.	
27.	Kurella Madhuri Laxmi		Emami Ltd
28.	L Sai Kumar	L & T ECC	
29.	Lohiya Nipun Nishant		Futures First
30.	Mudholkar Shashank	Sunflag Iron & Steel	
31.	Nagarale Kirti Iranna	JSW	
32.	Nimje Akshay Chandrakant	L & T ECC	Coal India
33.	Ojita	VA TECH WABAG LTD	
34.	Rupali Yogendra Vinayak	L & T Powai	
35.	Abhinav Sharad Panpalia		
36.	Paresh Bhanudas Patil	Crompton Greaves Ltd.	
37.	Patil Aditi Ravindra	L & T Powai	
38.	Phatak Sanjeet		
39.	Pillai Srikant Pradeepkumar	EXL Decision Analytics	
40.	Prasoon Mishra	L & T ECC	Coal India
41.	Purushotam Kumar	Reliance Industries Limited	Coal India
42.	Pyla Anwesh	Thyseenkrupp	
43.	Ramkrapal Meena		Coal India
44.	Choudhary Ravi	JSW	

	Omprakash		
45.	Sachin Mahajan	L & T ECC	
46.	Sagarika Behera	LG	
47.	Saumya Pandey	Thyseenkrupp	
48.	Sawardekar Yogesh Suresh	Kalyani Steels Ltd.	
49.	Shah Karan Dilip	Tata Power	
50.	Shantanu Arya	SMS Infrastructure Ltd.	
51.	Shashank Dixit	Ginger Webs Pvt. Ltd.	
52.	Shivendra Mohan Jha	L & T ECC	
53.	Shubham Balki	Mu Sigma	
54.	Shubhashish Garg		ZS Associates
55.	Shweta Sudhir Pardikar	NMRCL(Nagpur Metro Rail Corporation Ltd.)	
56.	Silba Mathew	L & T Powai	
57.	Sonaksh Sharma	JSW	
58.	Soumyajit Roy	L & T ECC	
59.	Sourabh Pareek	Crompton Greaves Ltd.	
60.	Sriram Vangalapudi		Coal India
61.	Sumit Kumar	SMS Infrastructure Ltd.	
62.	Ugale Nilesh Ramesh	Crompton Greaves Ltd.	
63.	Uppalapati Mohan	Tata Motors	
64.	Vignesh Venkatachalam	Mu Sigma	
65.	Vinay Kumar	JSW	
66.	Shah Visarg Paresh		Futures First
67.	Vishwanathan Subramanian		ZS Associates
68.	Wadje Ajay Shivajirao	JSW	Coal India
69.	Aishwarya Kumar	Infosys	
70.	Dautpure Tejashree Pradeep	L & T Powai	Fractal Analytics

Placement details of students : 2013-14 and 2012-13 are given in **Annexure I**

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

The PEOs are being formally defined for the first time.

However, following activities in the department helps to define the PEOs.

1. Academic activities – lectures, lab experiments, projects, seminars, industrial

visits and deputation for conferences / workshops
2. Monthly departmental meeting
3. Mentor meeting for quality improvement
4. Participation of student committee and its feedback
5. Peer review of the departmental academic activity
6. By feedback from employers, alumni and passing out graduates in every 3-4 years.

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)

The **Course Outcomes (COs)** are enclosed in **Annexure - II**

The **Program Outcomes (POs)** are as follows:-

Students are able to-

a. **Scholarship of Knowlegde:** Apply the ***knowledge*** of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
b. **Critical Thinking:** Shoulder responsibilities in planning and utilization of Electrical Energy by ***analyzing the processes*** critically.
c. **Problem Solving:** ***Design*** Electrical and Electronics systems to meet specific social needs and problems.
d. **Research Skill:** Analyze and model the Electrical and Electronics systems and hence effectively contribute towards ***research and complex problem.***
e. **Usage of Modern Tools:** Cope up with the ***state-of-art (Modern Tool)*** in Electrical and Electronics Engineering in tune with modern engineering tools.
f. **Collaborative and Multidisplinary work:** Contribute in academics by way of multidisciplinary works involving ***social health***, safety, legal, and consequent responsibility.
g. **Environment and Sustainability:** Appreciate the impact of industrial activities on global warming and finding the ***sustainable technical solutions*** through independent and reflective learning.
h. **Ethics:** Understand the importance of financial aspects in power system infrastructure development with ***ethical principles*** and social responsibilities.
i. **Individual and Team Work:** Undertake project in emerging areas to function effectively as an **individual**, and as a member or leader in diverse **team**s.
j. ***Communication: Communicate*** effectively with diverse audiences and able to write/present effective reports and design technical documentation.
k. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and ***life-long learning*** in the broadest context of technological ch ange.

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

- Departmental syllabus booklet,
- Departmental information brochure,
- Institute website link to Department,
- Classrooms, Laboratories and Department Premises.

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

- The curriculum improvement, modifications, and additions are governed by **Board of Studies (BOS)** and executed through **senate** on a continuous basis through 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 through **academic committee** duly constituted with the experts from the **IIT / NIT / Industry / Research Institutes / Alumni**.
- 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 Dean (Academics) and approved by senate.
- However, there is **enough flexibility** to enhance POs through the avenues of project seminars, co-curricular activities and poster exhibition.

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.)

POs → / **Graduate Attributes ↓**	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Scholarship of Knowledge	3	3	3	3	3	1	3	1	1	1	2
2. Critical Thinking	3	3	3	3	3	2	3	1	2	1	3
3. Problem Solving	3	3	3	3	3	2	2	2	1	1	2
4. Research Skill	3	3	3	3	3	1	-	1	2	2	2
5. Usage of modern tools	3	3	3	3	3	1	2	1	2	1	1

6. Collaborative and Multidisciplinary work	3	3	3	3	-	2	3	2	2	2	3
7. Project Management and Finance	2	3	3	2	3	2	2	2	3	3	2
8. Communication	1	1	1	1	1	1	1	1	1	1	1
9. Life-long Learning	3	3	3	3	3	1	2	2	2	1	3
10. Ethical Practices and Social Responsibility	1	1	1	1	1	3	2	3	1	1	2
11. Independent and Reflective Learning	3	3	3	3	3	1	2	1	2	2	1

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 ⇩	1. Higher studies	2. Constantly evolving technology	3. Technical / professional career	4. Green technology
a. Knowledge	3	3	3	3
b. Analyzing the processes	3	3	3	3
c. Design	3	3	3	3
d. Research and complex problem	3	3	3	3
e. State-of-art (Modern Tools)	3	3	3	3
f. Society	2	2	2	3
g. sustainable technical solutions	1	2	2	3

h. Ethical principles	1	1	1	1
i. Individual and Team Work	3	3	3	3
j. Communication	1	1	2	2
k. Life long learing	3	3	3	3

Explaination:

1. [a to 1,2,3,4]: Mathematics and science being the building blocks of engineering; a strong foundation in these will definitely facilitate the students to persue higher studies, for coping up with constanly evolving technology, enabaling the graduates for their successful career and inculcating the impoetance of green technology.
2. [b to 1,2,3,4]: Critically analysing the process helps a lot for persuing higher studies gearing up with new technology, beneficial for technology / professional career and dealing with environmental issues.
3. [c to 1,2,3,4]: Designing of system is important for further studies, lifelong learning, successful career and sustainable development.
4. [d to 1,2,3,4]: Higher education, emerging technology, career path and global warming need the orientation of research and complex problem.
5. [e to 1,2,3,4]: Modern tools in engineering are indespensible for carrying out higher studies, understanding new technology, achieving career goals and environmental issues.
6. [f to 1,2,3,4]: For solving complex socital issues multidisciplinary approach is welcome.
7. [g to 1,2,3,4]: Attempts are made to sensitize towards harmful effects on the environment.
8. [h to 1,2,3,4]: Values need to be inculcated along with the routine teaching learnng process.
9. [i to 1,2,3,4]: Undertaking the projects (individually / team) helps in higher studies, solving the problems related to new technology, for beneficial career path and knowing the importance of surroundings.
10. [j to 1,2,3,4]: In the current information and technological age, communication plays vital role in dessimminating the knowledge.
11. [k to 1,2,3,4]: For overall continuing development is not possible without life long learning.

2.2. Attainment of Programme Outcomes (40)

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

Complete syllabus structure is presented **Annexure –II**. It is indicated below, how the course outcomes (COs) contribute to programme outcomes (POs). Sample mappings are presented here and complete mapping between COs and POs are given in **Annexure –II**

EEL101 Basic Electrical Engg

POs / COs	Statements	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
CO1	***Basics of R, L,C circuit elements***	3	3	1	1	1	-	1	1	-	-	3
CO2	***Analysis using KVL and KCL***	3	3	3	3	-	-	-	-	1	-	3
CO3	***Analogue electrical measuring instrument***	3	2	-	-	1	-	-	-	-	-	2
CO4	***Study of machines, Transformer***	3	2	1	1	2	2	-	2	1	2	3

EEL201: Network Theory

POs / COs	Statements	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing

CO1	***Basics electrical circuit***	3	3	3	3	1	1	-	-	-	-	3
CO2	***Electrical network theorems***	3	3	3	3	3	-	-	--	-	1	3
CO3	***Apply Laplace Transform***	3	3	3	3	3	1	-	-	-	-	2

EEL203: Electrical Machine I

POs / ***COs***	**Statements**	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
CO1	***Winding in electrical machines***	3	3	3	2	2	-	-	-	1	1	3
CO2	***Working of DC machines***	3	3	3	2	2	-	-	-	1	1	3
CO3	***Three phase transformer***	3	3	3	3	3	-	-	-	1	2	3
CO4	***Induction motor***	3	1	1	1	1	-	-	-	1	2	3

EEL301: Electrical Power System-I

POs / COs	Statements	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
CO1	***p.u. calculation***	3	3	3	3	3	3	-	-	2	-	3
CO2	***Basics of electrical power transmission system.***	3	3	3	3	3	3	2	-	3	2	2
CO3	***Load flow problems***	3	3	3	2	3	3	2	-	3	2	2
CO4	***Concepts of different control model***	3	3	3	3	2	3	2	-	3	2	2

EEL305: Control System –I

POs / COs	Statements	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
CO1	***Modeling and derivation of transfer function***	1	2	1	2	2	2	-	1	2	2	3
CO2	***stability of system and the time domain analysis***	2	2	2	2	3	2	1	1	2	3	3
CO3	***Analysis of systems in frequency domain***	3	3	2	2	3	2	1	1	2	3	3
CO4	***State space modeling of system***	2	2	3	3	3	2	1	1	2	3	3

EEL401: Electrical Power System-I

POs / COs	Statements	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
CO1	***Apply symmetrical components concepts in fault analysis***	3	3	3	3	3	1	3	1	1	2	3
CO2	***Analyze different faults in power system.***	3	3	3	3	3	1	3	1	1	2	3
CO3	***Appreciate concepts of transient stability***	3	3	3	3	3	2	3	1	2	2	3
CO4	***Understand economic operation of power system***	3	3	3	2	3	3	2	2	3	2	3

EEL 403: Switchgear and Protection

POs / COs	Statements	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
CO1	***Philosophy of protective relaying***	3	3	1	1	1	1	-	-	-	1	1
CO2	***Over Current protection***	3	3	3	3	2	1	-	-	-	1	1
CO3	***Differential Protection***	3	3	3	3	2	1	-	-	-	1	1
CO4	***Distance Protection.***	3	3	2	3	2	1	-	-	-	1	1
CO5	***Switchgear***	3	2	2	3	2	1	1	-	-	-	1

Note:

Enter correlation levels 1, 2 or 3 as defined below:

1: Slight (Low)2: Moderate (Medium) 3: Substantial (High), If there is no correlation, put "-"

Add more columns for PSOs
*The table 3.1 can be prepared in **landscape** mode if required.*

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.)

Modes of Delivery / POs	1. Black / White Boards	2. PPT	3. Guest Lecture	4. Visit	5. Presentation(audio-video, file, paper, oral, poster, etc.)
a. Knowledge	3	3	2	2	3
b. Analyzing the processes	3	3	2	2	2
c. Design	3	3	2	2	2
d. Research and complex problem	3	3	2	2	2
e. State-of-art (Modern Tools)	3	3	2	2	2
f. Society	1	1	1	2	1
g. Sustainable technical solutions	2	2	2	2	2
h. Ethical principles	-	-	2	2	2
i. Individual and Team Work	-	-	1	2	2
j. Communication	2	2	2	3	3
k. Life long learing	-	-	2	2	2

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)

POs / Assessments	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
Assignments	3	3	3	3	3	-	2	1	2	3	2
Examination	3	3	3	3	3	1	2	1	2	3	1
Projects	3	3	3	3	3	2	2	2	3	3	3
Seminar	3	3	3	3	3	1	2	1	3	3	3

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

1. Projects are based on mathematical modelling through simulation
2. The hardware prototyping through various building blocks are carried out in the respective laboratories for these projects.
3. The project work is spread over one year and it carries 12 credits. The project seminar provides a platform for attainment of a number of POs.
4. Each faculty member is supervising on an average five / six students.
5. Students are also encouraged to do projects with industries leading to higher fulfilment of POs.
6. Project based learning provides additional application orientation to the subjects.
7. Projects provide significant learning and ability to design and develop systems and apply the knowledge in the real world which directly and significantly contributing to attainment of POs.
8. All lab experiments are designed to achieve POs.
9. Laboratory experiments are designed to provide hands on practice with state-of-art tools used for measurement and analysis.
10. Students are required to perform experiments in a group, to carry out discussion on the results and submit report in the form of laboratory journal
11. Students are made to design the electrical system and analyse the same using simulation software through lab experiments

POs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
Laboratory	3	3	3	3	3	1	2	1	3	3	3
Project Work	3	3	3	3	3	1	2	1	3	3	3

POs / Laboratory	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
Basic Electrical Engg.	3	3	1	1	1	1	1	1	2	2	2
Machine lab	3	3	2	2	2	1	1	1	2	2	2
Power Electronics	3	3	3	3	3	1	2	1	2	2	2
Measurement and Instrumentation	3	3	2	2	2	1	1	1	2	2	2
Electrical Drives	3	3	3	3	3	1	2	1	2	2	2
Control System	3	3	3	3	3	1	1	1	2	2	2
Power System Protections	3	3	3	2	3	1	1	1	2	2	2
High Voltage Engg	3	3	2	2	2	1	1	1	2	2	2
Micro Processer	3	3	2	2	3	1	1	1	2	2	2

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.

A) Assessment tools

- 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.
- Performance of students in IES/CSIR/DRDO examinations is an indicator for attainment of the PO.
- Assessment is continuous throughout the semester. After every written examination students are shown their valued answer books and discussed with course coordinators. This gives complete transparency in examination. Students are benefited by discussing their answers and perceptions with the faculty

members.

- Feedback from industries experts based upon performance of the students in interviews which is passed on to usby the T & P section.

B) Process

The curriculum improvement, modifications and additions are governed by **Board of Studies (BOS)** and executed through **senate** on a continuous basis through 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 through **academic committee** duly constituted with the experts from the **IIT / NIT / Industry / Research Institutes / Alumni**. 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 Dean (Academics) and approved by senate.

Sr. No.	Tools	Frequency
1	Examination / Assessment	4 per semester
2	Academic audit	Once in a year
3	BoS	Twice in a year
4	Senate	4 times in a year
5	Students feedback	3 times in a semester
6	Exit feedback from students	Once in a year
7	Employers feedback	Once in a year
8	Alumni meetings	Once/Twice in a year

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

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;

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

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

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

e) How the results are documented and maintained.

1. Semester end examinations: Sixty percent weightage is given to assess the each subject having all COs covered.
2. Mid-semester tests: Thirty percent weightage is given to two mid semester tests as a continuous assessment covering respective COs of each subject.

3. Internal assessment: Ten percent weightage is given for assessment by course coordinator based on quizzes, home assignments, seminars, mini projects, surprise tests etc.
4. Laboratory examinations: Laboratory evaluation is by continuous assessment based on performance, viva-voce, written objective type test, quizzes etc.
5. The process of CO attainment calculations for each subject is detailed as follows
6. Semester end examinations: Sixty percent weightage is given to assess the each subject having all COs covered.
7. Mid-semester tests: Thirty percent weightage is given to two mid semester tests as a continuous assessment covering respective COs of each subject.
8. Internal assessment: Ten percent weightage is given for assessment by course coordinator based on quizzes, home assignments, seminars, mini projects, surprise tests etc.
9. Laboratory examinations: Laboratory evaluation is by continuous assessment based on performance, viva-voce, written objective type test, quizzes etc.
10. The process of CO attainment calculations for each subject is detailed as follows

(2.3.2) PO Attainment: Direct method

<table>
<tr><td>Step 1</td><td>Define CO for the subject</td><td></td></tr>
<tr><td>Step 2</td><td>Define how these CO relate to each of the Pos and PSOs</td><td></td></tr>
<tr><td>Step 3</td><td>Set Question paper such that all the CO s are covered and mark against each question which CO the question is addressing to
<table>
<tr><td></td><td></td><td>CO1</td><td>CO2</td><td>CO3</td><td>CO4</td></tr>
<tr><td>Q1</td><td>10</td><td>1</td><td></td><td></td><td></td></tr>
<tr><td>Q2</td><td>10</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td>Q3</td><td>10</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td>Q4</td><td>10</td><td></td><td>1</td><td>1</td><td></td></tr>
<tr><td>Q5</td><td>10</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td>Q6</td><td>10</td><td></td><td></td><td></td><td>1</td></tr>
</table></td><td></td></tr>
<tr><td>Step 4</td><td>Evaluate the answer sheets</td><td></td></tr>
<tr><td>Step 6</td><td>Enter the marks scored by students against each question
<table>
<tr><td>Q no</td><td>Roll no 1</td><td>Roll no 2</td><td>..</td><td>..</td><td>..</td><td>Roll no 60</td></tr>
<tr><td>Q1</td><td>7</td><td>10</td><td>9</td><td>10</td><td>11</td><td>5</td></tr>
<tr><td>Q2</td><td>5</td><td>9</td><td>8</td><td>8</td><td>10</td><td>4</td></tr>
<tr><td>Q3</td><td>8</td><td>8</td><td>6</td><td>6</td><td>9</td><td>6</td></tr>
</table></td><td></td></tr>
</table>

Q4	10	9	8	6	7	4
Q5	9	7	5	8	12	8

Step 7

Enter the marks scored by students against each question. Also make a column of max marks allotted to each question.

Q no	Max marks	Average	Cos mapped against these question	Roll no 1	Roll no 2	..	..	..	Roll no 60
Q1			CO1	7	10	9	10	11	5
Q2			CO2	5	9	8	8	10	4
Q3			CO1,CO2	8	8	6	6	9	6
Q4			CO3	10	9	8	6	7	4
Q5			CO4	9	7	5	8	12	8

Step 8

Calculate the CO attainment is percentage

	Column 2	Column 3	Column 4
	Total marks scored by average class against this CO	Maximum marks that could be scored by the student	CO attainment in percentage $= \frac{Column\ 2}{Column\ 3}$
CO1			
CO2			
CO3			
CO4			

CO PO Coorelation matrix											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
	a	b	c	d	e	f	g	h	i	j	k
CO1	3.00	3.00	3.00	3.00	2.00	2.00	0.00	0.00	2.00	0.00	1.00
CO2	3.00	3.00	2.00	3.00	3.00	2.00	0.00	0.00	2.00	0.00	3.00
CO3	3.00	3.00	2.00	2.00	2.00	2.00	0.00	0.00	1.00	0.00	1.00
CO4	2.00	2.00	2.00	3.00	2.00	1.00	0.00	0.00	2.00	0.00	2.00
	0.58	0.58	0.48	0.59	0.48	0.37	0.00	0.00	0.37	0.00	0.38
MAX	0.92	0.92	0.75	0.92	0.75	0.58	0.00	0.00	0.58	0.00	0.58
TARGET	0.64	0.64	0.53	0.64	0.53	0.41	0.00	0.00	0.41	0.00	0.41
%ATTAIN	90.75	90.75	91.00	91.48	91.27	90.59			91.73		92.08
TARGET%	70.00										

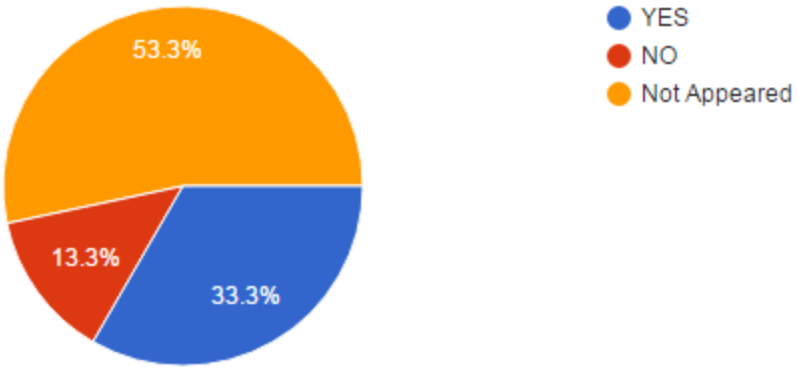
Subject	CO1	CO2	CO3	CO4		AV CO					
	0.64	0.65	0.60	0.66		0.64					
	1.00	1.00	1.00	1.00							
						PO Attain					
						0.90					

POs / Course	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
EEL101	50.41	41.78	21.06	21.06	16.98	8.82	3.94	12.77	8.65	8.82	46.19
EEL201	27.25	27.25	27.25	27.25	20.36	6.78	0.00	0.00	0.00	2.31	23.91
EEL202	45.33	41.40	40.60	41.40	35.86	15.11	15.11	15.11	15.11	31.02	45.33
EEL203	43.50	39.83	34.50	29.00	18.08	14.50	10.92	14.50	21.75	10.92	43.50
EEL206	54.04	31.93	38.40	67.78	31.93	31.93	29.38	9.44	29.38	37.46	55.38
EEL215	50.41	46.17	42.23	42.23	37.82	21.01	16.80	0.00	33.60	16.80	0.00
EEL301	46.17	25.00	29.25	55.25	25.00	25.00	26.00	11.67	26.00	31.42	44.75
EEL302	60.29	54.41	50.73	40.19	24.04	20.10	16.15	20.10	29.92	16.15	60.29
EEL303	42.78	39.15	42.78	34.35	43.09	17.18	17.18	9.46	0.00	17.18	51.53
EEL304	58.23	58.23	47.78	58.70	47.92	36.99	0.00	0.00	37.46	0.00	0.00
EEL305	41.85	47.52	42.82	42.82	47.52	17.47	12.59	0.00	17.47	0.00	52.40

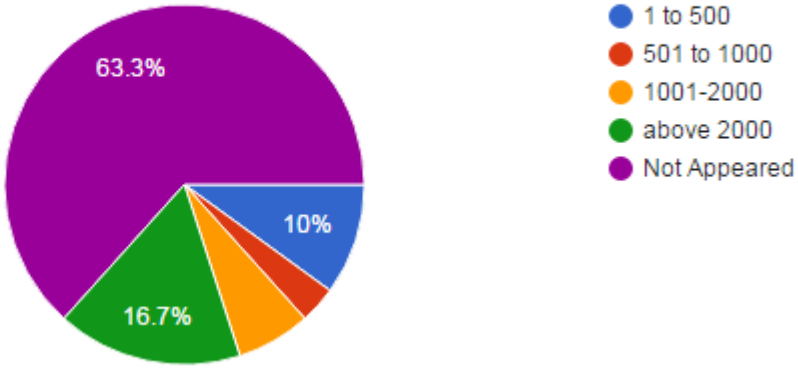
EEL307	55.05	55.05	55.05	51.26	51.26	18.35	18.35	22.68	18.35	0.00	18.35
EEL401	59.96	59.96	59.96	54.06	59.96	36.16	54.06	25.88	36.16	39.97	59.96
EEL402	56.40	46.52	51.40	36.93	46.93	32.72	18.80	18.80	37.60	23.13	51.40
EEL403	56.42	56.42	41.77	46.01	32.41	18.81	0.00	0.00	0.00	18.81	18.81
EEL404	44.01	40.26	39.14	44.38	52.53	17.51	13.39	0.00	17.51	0.00	52.53
EEL405	44.84	46.09	41.43	33.00	16.50	33.23	29.59	0.00	46.09	24.93	44.70
EEL406	38.25	35.42	31.00	25.50	15.17	12.75	10.33	12.75	18.00	10.33	38.25
EEL410	100.00	75.00	66.67	75.00	91.67	66.67	25.00	33.33	66.67	91.67	100.00
EEL411	42.58	35.55	28.38	28.38	14.19	28.38	28.38	0.00	21.36	0.00	28.38
EEL412	66.70	66.70	56.15	61.42	56.15	0.00	0.00	0.00	0.00	0.00	22.23
EEL413	51.78	39.02	43.10	47.19	38.60	17.26	8.68	4.08	0.00	0.00	25.43
EEL414	47.85	39.35	43.63	22.38	39.41	19.16	19.16	0.00	19.16	31.90	47.85
EEL416	63.84	64.88	59.10	46.41	23.21	48.02	41.67	0.00	64.88	35.89	63.28
EEL417	74.48	43.66	31.12	43.62	43.32	31.12	31.54	24.83	37.79	0.00	49.65
Avg	**52.53**	**46.01**	**42.30**	**42.48**	**36.46**	**23.44**	**17.61**	**9.61**	**24.03**	**17.68**	**41.83**

PO Attainment: Indirect method

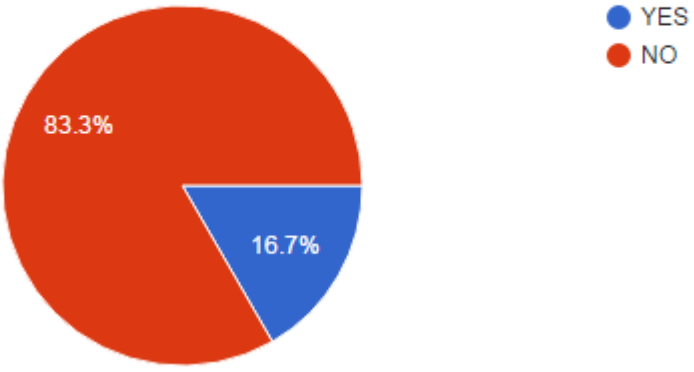
Had you cleared GATE Examination (30 responses)



If you had cleared GATE Pl specify your rank (30 responses)

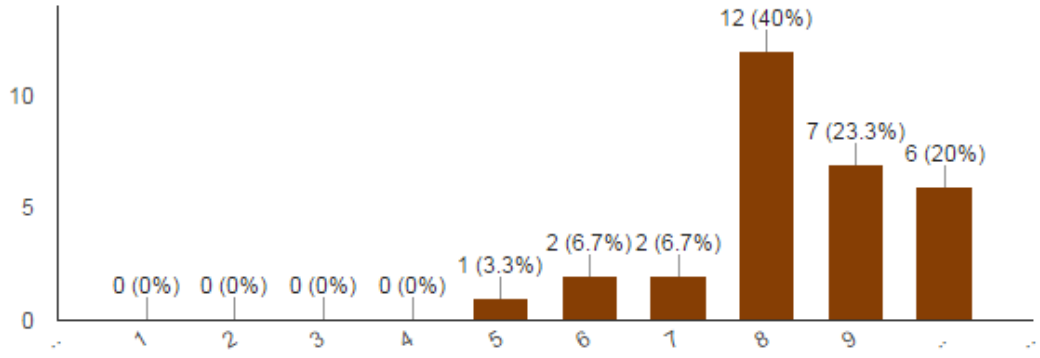


Did you get admission in any foreign University (30 responses)



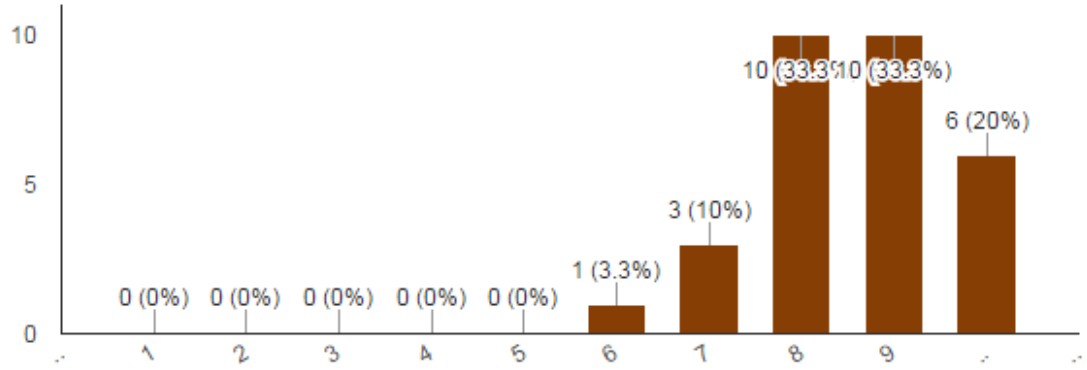
PO1: Engineering Knowledge: Are you able to apply knowledge of mathematics,science and engineering to solution of complex engineering Problems

(30 responses)



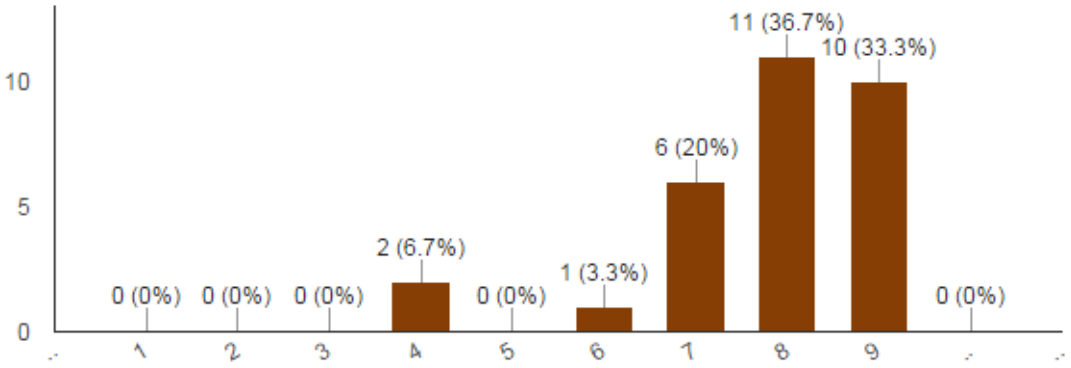
PO2: Problem Analysis: Are you able to analyse complex engineering problems using first principles of Engineering/Science

(30 responses)



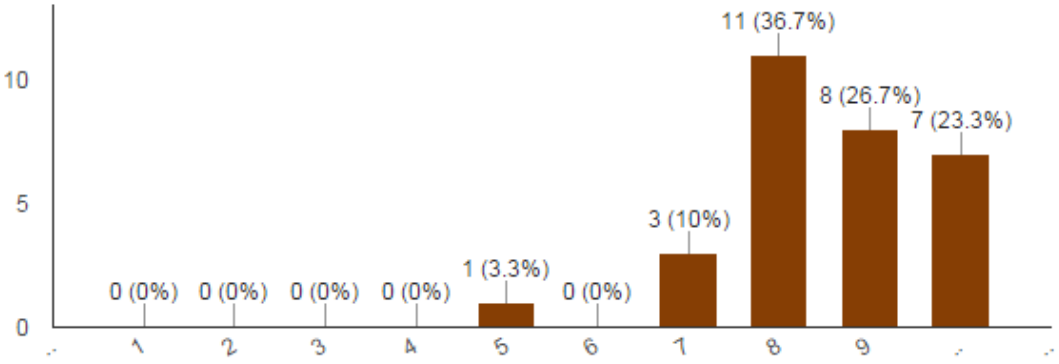
PO3: Are you able to design/develop solutions for complex engineering problems and design components/ processes of the system?

(30 responses)



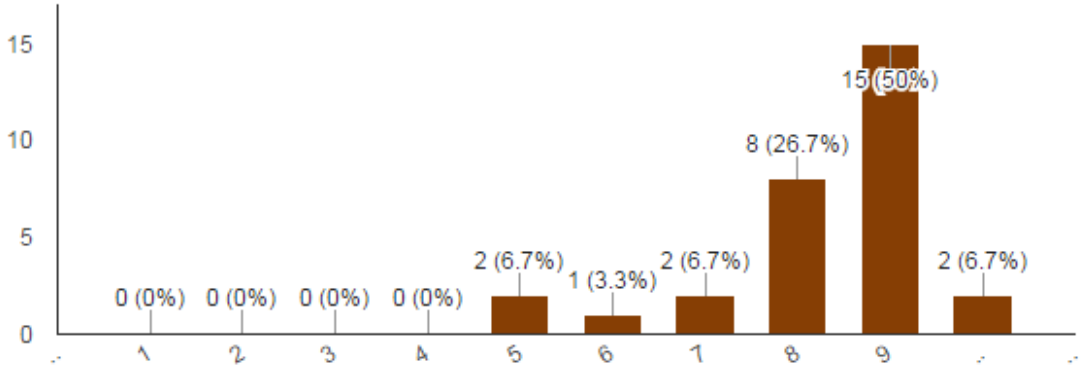
PO4: Conduct Investigations: Are you able to use your knoweledge and research methods for analysis, interpretation and synthesis of the information

(30 responses)



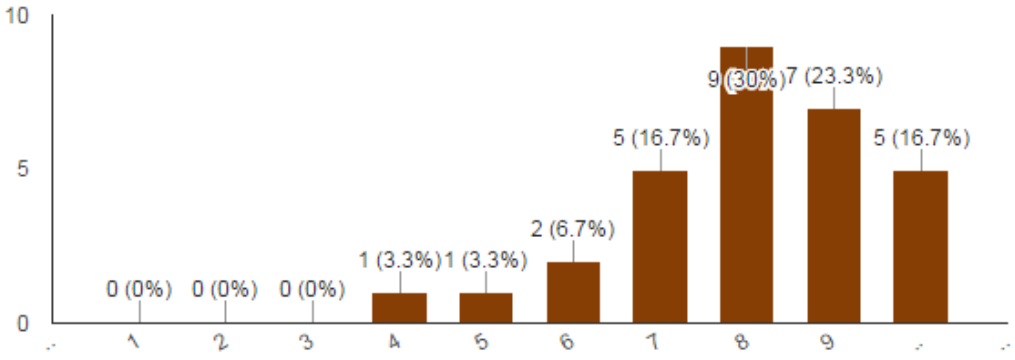
PO5: Modern Tool Usage: Are you able to use IT tools and modern engineering tools for modelling of complex engineering problems?

(30 responses)



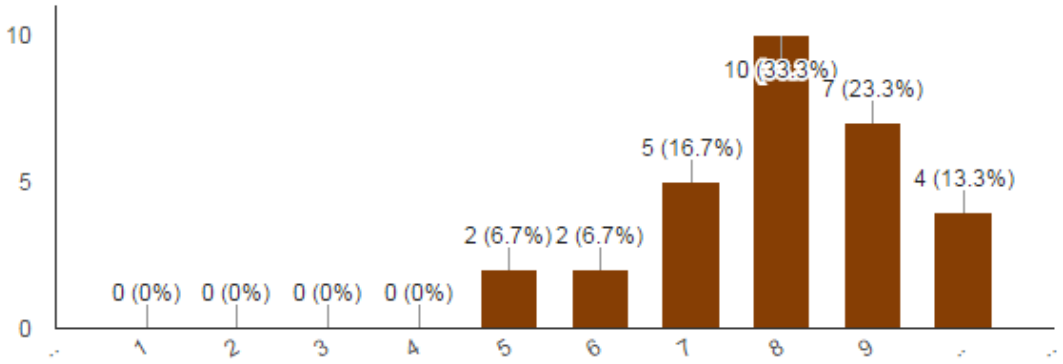
PO6: Engineering & Society: Are you able to apply contextual knowledge to assess societal, health,safety, legal and cultural issues to professional engineering practice

(30 responses)



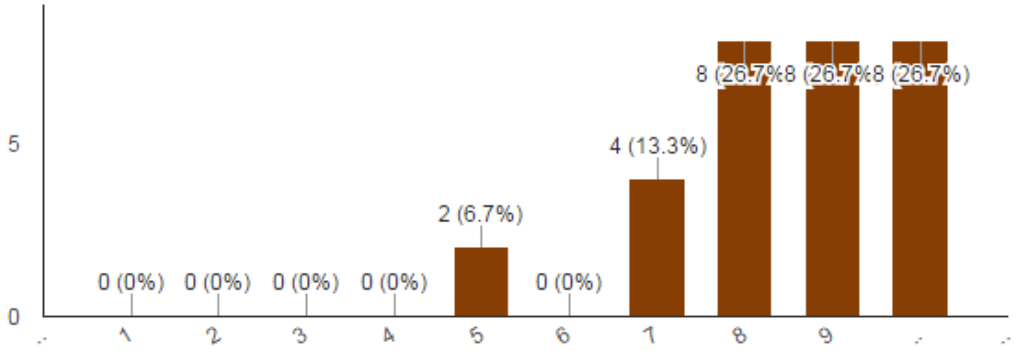
PO7: Environment & Sustainability: Are you able to understand impact of Engineering solutions on environment & Society as well as need for sustainable development?

(30 responses)

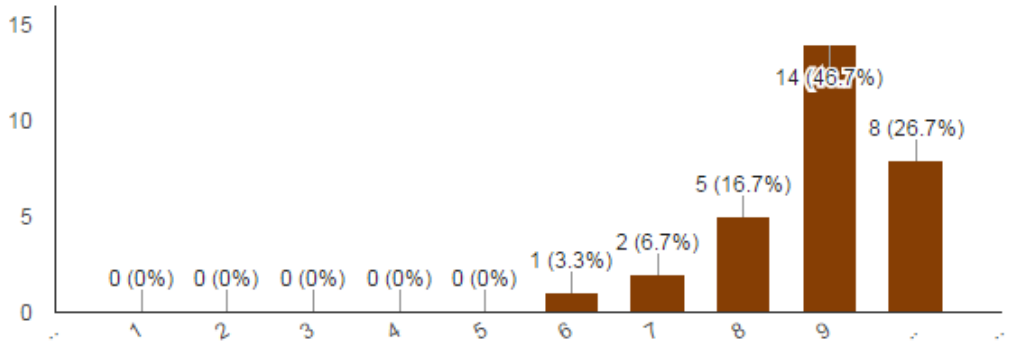


PO8: Ethics: Are you able to apply ethical principles and commit to professional ethics & responsibilities of engineering practice?

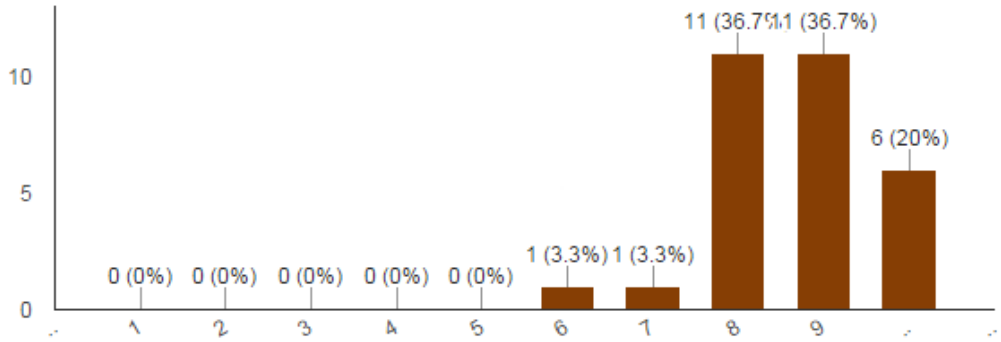
(30 responses)



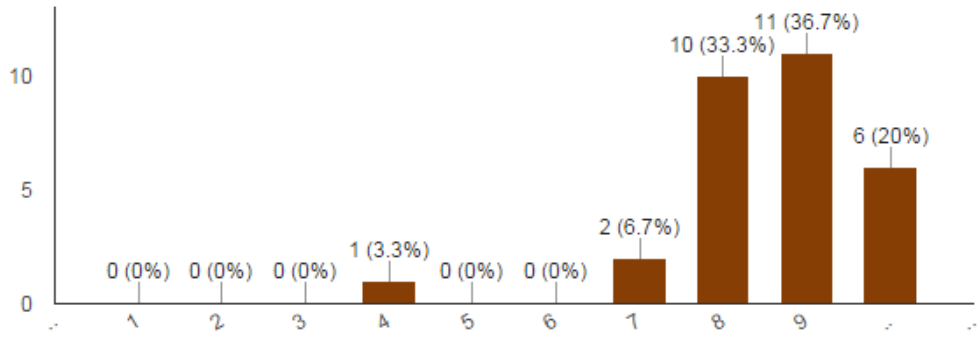
PO9: Individual & Team Work: Are you able to function effectively as an individual and as a leader in diverse teams & in multi-disciplinary settings
(30 responses)

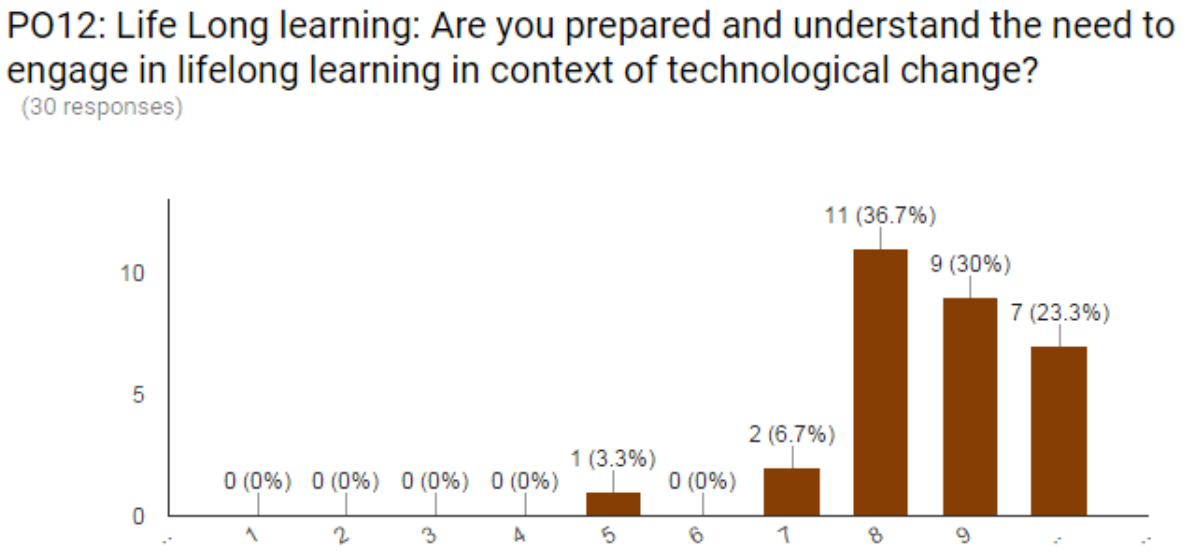


PO10: Communication: Are you able to communicate effectively on complex engineering activities with engineering community and society at large (through effective reports/ presentations/oral& written instructions)?
(30 responses)



PO11: Project Management & Finance: Are you able to apply engineering and management principles to manage projects in multi-disciplinary environment?
(30 responses)





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)

1. In every semester two class committee meetings with student representative are held during which feedback is obtained.
2. At the end of semester a formal feedback regarding teacher and course evaluation form is collected.
3. Each subject is assessed with the performance of the students including those failed.
4. Inputs are collected from the alumni/industry personnel during formal/informal meetings
5. Any deficiency on account of content/teaching in the subject is modified in BOS meeting in the light of the above.

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

1. The course evaluation and deliverable skills of the teacher are assessed by the students in each semester.
2. This feedback is compiled by the committee and ATFS (Average Teacher Feedback Score) is calculated for individual teacher.
3. ATFS result is communicated to the Dean (Academics) and also to the concerned teacher.
4. Mentoring is done by HOD in those cases required improvement in course delivery and assessment.
5. Academic audit is conducted by faculties from IIT/IISc to evaluate various aspects as under

   a. Modification in the course content

b. Delivery of the course
c. Evaluation of examination system
d. Evaluation of marking methodology
e. Correctness of mapping of COs as declared in the syllabus

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

The POs are being formally defined for the first time.
However, following a process will be used for revising and redefining the POs

1. Student Feedback: Formal and informal
2. Alumni Feedback: Through meeting
3. Interaction with Industry Personnel: visits and campus interviews
4. Informal Department Meeting: Continuing activity
5. BOS: Periodic meeting
6. Power Engineering Society (PES): Student co-curricular activity
7. Suggestion Box: Providing opportunity for anonymous feedback

3. Programme Curriculum (125)

3.1. Curriculum (20)

3.1.1. Describe the Structure of the Curriculum (5)

Category	**Credits**
Departmental Core (DC)	146
Departmental Elective (DE)	72-90
Basic Sciences/1st Year	78
HM	0-6
OC	0-12

I / II Semester			
Code	Course	L-T-P	Credits
Core			
EEL101	Electrical Engineering	3-0-0	6

III Semester			
Code	Course	L-T-P	Credits
Core			
EEL201	Network theory	3-0-0	6
ECL206	Electronic Devices and Circuits	3-0-0	6
MAL201	Integral transform and PDE	3-0-0	6
EEL204	Measurement and Instrumentation	3-0-0	6
EEP201	Network Lab	0-0-2	2

ECP206	EDC Lab	0-0-2	2
EEP204	Measurement and Instrumentation Lab	0-0-2	2
Elective			
EEL206	Electromagnetic	3-0-0	6

IV Semester			
Code	Course	L-T-P	Credits
Core			
EEL202	Signals and Systems	3-0-0	6
EEL203	Electrical Machines-I	3-0-0	6
ECL207	Digital Circuits	3-0-0	6
EEP203	Electrical Machines-I Lab	0-0-2	2
ECP207	Digital Circuits Lab	0-0-2	2
Elective			
EEL208	MATLAB Programming	2-0-2	4
PHL202	Intro to Material Science	3-0-0	6
MAL205	Numerical Methods & Probability Theory	3-0-0	6
EEL215	Electrical Power Utilization	3-0-0	6
EEP207	Adv Prog. Lab	0-0-2	2
EEP208	MATLAB Prog. Lab	0-0-2	2

V Semester			
Code	Course	L-T-P	Credits
Core			
EEL301	Electrical Power System-I	3-0-0	6
ECL321	Microprocessor &Interfacing	3-0-0	6
EEL302	Electrical Machine-II	3-0-0	6
EEL305	Control System-I	3-0-0	6
EEP302	Electrical Machine-II Lab	0-0-2	2
EEP305	Control System-I Lab	0-0-2	2
EEP306	Electrical Engg Workshop Lab	0-0-2	2
Elective			
EEL307	Electrical Machine Design	3-0-0	6
EEL405	Power Station Practice	3-0-0	6

VI Semester			
Code	Course	L-T-P	Credits
Core			
EEL303	Power Electronics	3-0-0	6
EEL304	Electric Drives and Control	3-0-0	6
ECL320	Linear Electronic Circuits	3-0-0	6
EEL401	Electrical Power System-II	3-0-0	6

EEP303	Power Electronics Lab	0-0-2	2
ECP320	Linear Electronic Circuits Lab	0-0-2	2
ECP321	Microprocessor Lab	0-0-2	2
Elective			
EEL406	Electrical Installation Design	3-0-0	6
EEL418	Control System-II	3-0-0	6
EED301	Mini Project	0-0-2	4
MEL424	Industrial Engg & Management	3-0-0	6

VII Semester			
Code	Course	L-T-P	Credits
Core			
EEL402	High Voltage Engineering	3-0-0	6
EEL403	Switchgear and Protection	3-0-0	6
EEP402	High Voltage Engineering Lab	0-0-2	2
EEP403	Switchgear and Protection Lab	0-0-2	2
EED401	Project Phase-I	0-0-2	4
Elective			
EEL409	HVDC	3-0-0	6
EEL417	Energy Conservation & Audit	3-0-0	6
EEL410	Advanced Control Theory	3-0-0	6
EEL421	Power Quality	3-0-0	6
EEL407	Electrical Power Distribution System	3-0-0	6

VIII Semester			
Code	Course	L-T-P	Credits
Core			
EEL404	Sampled Data & Digital Control	3-0-0	6
EED402	Project Phase-II	0-0-4	8
Elective			
EEL408	Advanced Power Electronics	3-0-0	6
EEL411	App of Power Electronics to Power System	3-0-0	6
EEL412	DSP App to Power System	3-0-0	6
EEL414	Microprocessor Applications in PE & PS	3-0-0	6
EEL413	Adv Elect Drives & Control	3-0-0	6
EEL416	Renewable Energy Sys	3-0-0	6
EEP415	Computer Application in Electrical Engineering Lab	0-0-2	2

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

Semester	Subject	Prerequisite Subjects
V	Electrical Machine II	Electrical Machine I

VI	Electrical Power System II	Electrical Power System I
VI	Control System II	Control System I
VIII	Advanced Power Electronics	Power Electronics
VIII	Application of PE to PS	Power Electronics
VIII	Advanced Electrical Drives and Control	Electrical Machine II
VIII	Sample Data and Digital Control	Signals and Systems
VIII	Project Phase II	Project Phase I

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)

1. The students study principles of engineering, basic sciences and engineering mathematics
2. Student learn to model, analyse and design electrical and electronics circuits and components
3. Students are prepared to work professionally in the field electrical power system, generation, transmission, distribution, operation and maintenance.

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/per year	Total number of credits	POs	PEOs
Mathematics	10%	120 Hrs	78	a,b,c,e,f,g,h,j,	2,3
Sciences	5%	80 Hrs		a,b,c,e,f,g,h,i,j,	1,3
Computing	5%	80 Hrs	12	h	1,2,3
Humanities	5%	80 Hrs	06	k	4
Professional core	75%	1240 Hrs	224	a,b,c,d,e,f,g,h,i,j,k	1,2,3,4

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)

POs / Subjects/ Courses	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solution	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
EEL101	50.41	41.78	21.06	21.06	16.98	8.82	3.94	12.77	8.65	8.82	46.19
EEL201	27.25	27.25	27.25	27.25	20.36	6.78	0.00	0.00	0.00	2.31	23.91
EEL202	45.33	41.40	40.60	41.40	35.86	15.11	15.11	15.11	15.11	31.02	45.33
EEL203	43.50	39.83	34.50	29.00	18.08	14.50	10.92	14.50	21.75	10.92	43.50
EEL206	54.04	31.93	38.40	67.78	31.93	31.93	29.38	9.44	29.38	37.46	55.38
EEL215	50.41	46.17	42.23	42.23	37.82	21.01	16.80	0.00	33.60	16.80	0.00
EEL301	46.17	25.00	29.25	55.25	25.00	25.00	26.00	11.67	26.00	31.42	44.75
EEL302	60.29	54.41	50.73	40.19	24.04	20.10	16.15	20.10	29.92	16.15	60.29
EEL303	42.78	39.15	42.78	34.35	43.09	17.18	17.18	9.46	0.00	17.18	51.53
EEL304	58.23	58.23	47.78	58.70	47.92	36.99	0.00	0.00	37.46	0.00	0.00
EEL305	41.85	47.52	42.82	42.82	47.52	17.47	12.59	0.00	17.47	0.00	52.40
EEL307	55.05	55.05	55.05	51.26	51.26	18.35	18.35	22.68	18.35	0.00	18.35
EEL401	59.96	59.96	59.96	54.06	59.96	36.16	54.06	25.88	36.16	39.97	59.96

EEL402	56.40	46.52	51.40	36.93	46.93	32.72	18.80	18.80	37.60	23.13	51.40
EEL403	56.42	56.42	41.77	46.01	32.41	18.81	0.00	0.00	0.00	18.81	18.81
EEL404	44.01	40.26	39.14	44.38	52.53	17.51	13.39	0.00	17.51	0.00	52.53
EEL405	44.84	46.09	41.43	33.00	16.50	33.23	29.59	0.00	46.09	24.93	44.70
EEL406	38.25	35.42	31.00	25.50	15.17	12.75	10.33	12.75	18.00	10.33	38.25
EEL410	100.00	75.00	66.67	75.00	91.67	66.67	25.00	33.33	66.67	91.67	100.00
EEL411	42.58	35.55	28.38	28.38	14.19	28.38	28.38	0.00	21.36	0.00	28.38
EEL412	66.70	66.70	56.15	61.42	56.15	0.00	0.00	0.00	0.00	0.00	22.23
EEL413	51.78	39.02	43.10	47.19	38.60	17.26	8.68	4.08	0.00	0.00	25.43
EEL414	47.85	39.35	43.63	22.38	39.41	19.16	19.16	0.00	19.16	31.90	47.85
EEL416	63.84	64.88	59.10	46.41	23.21	48.02	41.67	0.00	64.88	35.89	63.28
EEL417	74.48	43.66	31.12	43.62	43.32	31.12	31.54	24.83	37.79	0.00	49.65
Avg	**52.53**	**46.01**	**42.30**	**42.48**	**36.46**	**23.44**	**17.61**	**9.61**	**24.03**	**17.68**	**41.83**

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. Institute's requirement for involving experts from industry in teaching to cover up to 20% of syllabi, is being implemented.
2. Industrial visits for the students as a part of curriculum are undertaken by the department.
3. Guest lectures are also regularly arranged in the department.
4. Department regularly interacts with local industry by way of meetings to explore the possibility of getting student internships/training.
5. Students are also acquiring national/international scholarship for their internships.
6. The industry institute interaction helps to build students confidence in their problem solving abilities.

7. Students are encouraged to submit technical report.
8. The industry constituents have helped in departmental restructuring of our curriculum.
9. Informal discussion with them helps in starting new course/lab etc.
10. Alumni association is actively involved in offering internship/summer training to our under graduate students.
11. A special course on Entrepreneurship is being taught by industrial person, which is fully supported by Active Alumni association.

3.5. Curriculum Development (15)

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

- The broad curriculum is designed so as to make students understand electrical system operation, its analysis, control and management.
- This is further integrated with relevant laboratory experiments, projects, industrial visits and expert lectures/guest seminars.
- The industry institute interaction helps to incorporate the relevant technology in curriculum
- Departmental Academic Committee that comprises of the faculty of the department discusses the Curriculum and provides the first version of the syllabus.
- The Board of Studies, consisting of senior faculty of the department, and experts from reputed academic institutes and industry, discusses the draft syllabus thoroughly and suggest modifications, if any.
- The Academic Council of the institute gives the final ratification of the syllabus.

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

The following mechanisms are used to elicit relevant information with a view to improve courses and curriculum:-

- Student Feedback: Formal and informal
- Alumni Feedback: Through meeting
- Interaction with Industry Personnel: visits and campus interviews
- Informal Department Meeting: Continuing activity
- BOS: Periodic meeting
- Discussion with experts from IIT/IISc during academic audit.
- Power Engineering Society (PES): Student co-curricular activity
- Suggestion Box: Providing opportunity for anonymous feedback

These are thoroughly discussed in BOS meetings. The resolutions of the BOS are put before the institute Senate during its periodic meetings. All changes are subject to the approval of the Senate, which is the highest decision making body.

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*

Complete syllabus structure is presented **Annexure –II**.

4. Students' Performance (75)

Admission intake in the programme

Item	CAY 14-15	CAYm1 13-14	CAYm2 12-13
Sanctioned intake strength in the program (N)	92	92	92
Total number of admitted students in first year minus number of students migrated to other programs at the end of 1st year (N1)	98	92	93
Number of admitted students in 2nd year in the same batch via lateral entry (N2)	-	03	07
Total number of admitted students in the program (N1+N2)	98	95	100

4.1 Success Rate (20)

Year of entry (in reverse	Number of Students admitted in 1st year + admitted via lateral entry in 2nd year (N1+N2)	Number of students who have successfully completed*			
		1st year	2nd year	3rd year	4th year
CAY 14-15	98	90	-	-	-
CAYm1 13-14	95	89	85	-	-
CAYm2 12-13	100	83	76	73	-
CAYm3 (LYG) 11-12	93	74	71	70	69
CAYm4 (LYGm1) 10-11	97	78	75	71	70
CAYm5 (LYGm2) 09-10	93	81	81	79	79

*: Successfully completed implies zero backlogs

Success rate = 20 × 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 2nd year via lateral entry)

Item	**LYG (CAYm4)** 11-12	**LYGm1 (CAYm5)** 10-11	**LYGm2 (CAYm6)** 09-10
Number of students admitted in the corresponding First year + laterally admitted via lateral entry in 2nd year	93	97	93
Number of students who have graduated in the stipulated period	69	70	79
Success Index (SI)	0.74	0.72	0.84

Average SI = 0.766

Success Rate = 20* 0.766 = **15.3**

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 **(7.6)**
or	=	Mean of the percentage of marks of all successful students / 10

Av. Assessment for three years = (7.73+7.44+7.6)/3 = 7.6

Assessment = 2 x API = 2 x 7.6 **= 15.2**

4.2.1. Placement and Higher Studies (20)

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 (2011-12)**	**LYGm1 (2010-11)**	**LYGm2 (2009-10)**
Number of admitted students corresponding to **LYG** including lateral entry (N)	93	97	93
Number of students who obtained jobs as per the record of placement office (x1)	67	64	61
Number of students who found employment otherwise at the end of the final year (x2)	------	-------	-------
x = x1 + x2	67	64	61
Number of Students who opted for higher studies with valid qualifying scores/ranks (y)	03	05	06
Assessment Point	15.21	14.48	14.73

Average assessment points = **14.80**

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).

- IEEE Student chapters
- AXIS : National Level Student Technical Festival
- PES : Power Engineering Society
- Research Scholar Day
- Rajiv Gandhi Akshay Urja Divas (20 August)

- Guest lectures
- National Science Day
- Industrial Tours

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

- IEEE Chapter: Paper/Design Contest
- Poster Making Competition under Power Engineering Society

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. Texas instruments: Design and development of intelligent fault tracking system using optical fiber cable in Railway Tracks.
   Semifinalist awarded-cash prize of USD 200.
2. Railway Board: Real-Time Rail Fracture Detection system

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

- Organised at institute level (Axis)
- Innovative product design participation (GRIDTECH)

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

- Student participation in inter-collegiate paper competition
- Students awards in national science day paper competition/INEA
- Mr Ajay Jamodkar Final Year, April 2013, awardwd "Students Innovation Pavilian" in GRIDTECH 2013 at New Delhi
- Mr Ameya Chandrayan, Final Year, 2013 awarded Innovative Student Projects Award in Indian National Academi of Engineering, December 2013.

5. Faculty Contributions (175)

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

	Qualification	Desig	Date of	Distribution of Teaching Load (%)	Academic Research	Spons		Specia li

Name of the Faculty Member				nation (all the designations since joining the institute)	Joining the Institution	1st Year	UG		PG	Research Paper Publications	Ph.D. Guidance	Faculty Receiving Ph.D. during the Assessment Years	ored Research (Funded Research)	Consultancy and Product Development	zation
	Degree (starting from highest degree)	University	Year of Graduation				In Program	Other Program							
Dr. M. K. Khedkar	Ph.D M.Tech B.E	Nag. Univ VRCE GCOE Amt	1994 1982 1980	Lecturer, Assistant Professor, Professor	02-07-1984	On deputation as Vice Chancellor SGBAU, Amaravati From 24.02.2011 to 23.02.2016				Jour(39) Conf.(98) Total(137)	4	--	--	--	Power Systems
Dr. H.M. Suryawanshi	Ph.D M.E B.E	Nag. Univ IISc, Bgr GCOE Amt	1999 1994 1988	Lecturer, Assistant Professor, Professor	01/07/1989	--	10	30	60	Jour(60) Conf(126) Total(186)		--	DST: 182.5 Lakh	--	Power Electronics & Drives
Dr. M.V. Aware	Ph.D M.Tech B.E	Nag. Univ IIT, Bombay Nag. Univ	2002 1982 1980	Lecturer, Scientist-C, Assistant Professor, Professor	**01**/01/1991	--	--	40	60	Jour(48) Conf(135) Total(183)	4	--	BARC-BRNS 25 lakhs;	Consultancy 5.0Lakh	High voltage Engg., Electrical drives and Power Electronics
Dr. S.R. Bhide	Ph.D M.Tech B.E	Nag. Univ VRCE VRCE	2000 1980 1978	Lecturer, Assistant Professor, Asso. Professor, Prof	12/7/1984	--	--	60	40	Jour(12) Conf.(29) Total(41)	2	--	DST(FIST): 20 Lakhs		Power System Protection
Dr. B.S. Umre	Ph.D M.Tech B.E	Nag. Univ Nag. Univ Nag. Univ	2009 1986 1983	Lecturer, Assistant Professor, Asso. Professor	2/7/1984	--	20	60	20	Jour(03) Conf.(22) Total(25)	1	--	-	-	Power system, Tortional oscillations, Electrical Machines

Dr V.B. Borghate	Ph.D M.Tech B.E	Nag. Univ Nag. Univ Nag. Univ	2007 1984 1982	Lecturer, Assistant Professor, Asso. Professor, Professor	01/8/1985	--	30	60	30	Jour(10) Conf.(19) Total(29)	2	--	DST(FIST) 95 Lakhs CDAC 5 Lakhs		Power Electronics and Drives
Dr.(Mrs). M A. Chaudhari	Ph.D M.Tech B.E	Nag. Univ VRCE Nag. Univ	1989 2000 2007	Lecturer, Assistant Professor, Asso. Professor,	17/07/ 2008	--	50	-	50	Journal (14) Conf.(32) Total(46)	2	--	-	-	Power Electronics
Dr. P.S. Kulkarni	Ph.D M.E B.E	Nag. Univ GEC,Amt WCE, Sangli	2002 1994 1987	Lecturer, Assistant Professor, Asso. Professor,	16/3/1995	--	40	20	40	Journal (14) Conf.(33) Total(47)	2	--	MHRD 7 Lakhs	--	Power System Operation
Dr. M.R. Ramteke	Ph.D M.Tech AMIE	Nag. Univ VRCE IE(I)	2008 1993 1988	STA Lecturer, Assistant Professor, Asso. Professor	29/8/1989	20	40	20	20	Jour(9) Conf(30) Total(39)	01	--	TEQIP-II (12.25 Lakhs)	--	Power Electronics
Dr. S.S. Bhat	Ph.D M.Tech B.Tech	IIT Delhi VRCE VRCE	2009 1993 1986	Programmer, Lecturer, Assistant Professor, Asso. Professor	1/4/1987	-	50	-	50	Jour(10) Conf(08) Total(18)	-	--	DST 2 Lakhs	2.5 Lakhs	Power System
Dr. (Mrs) A.S. Junghare	Ph.D M.Tech B.Tech	VNIT Nag. Univ VRCE	2008 1985 1981	Lecturer, Assistant Professor, Asso. Professor	7/3/1995	30	70	-	-	Journal (16) Conf. (12 Total(28)	01	--	BRNS 25 Lakhs		Integrated Power System
Dr. M S Ballal	Ph.D M.Tech B.Tech	Nag. Univ VRCE GCE	2007 1997 1993	Asso. Professor	4/4/2012		100	-	-	Journal (27) Conf. (30 Total(57)	-	--	--		Integrated Power System

Dr. V S Kale	Ph.D M.Tech B.Tech	Nag. Univ VRCE GCE	2011 1994 1986	Lecturer, Assistant Prof. Asso. Professor	15/12/1988		70	-	30	Jour(16) Conf.(25) Total(41)	-	--	--		Power System protection and Optimization
Prof. S.R. Tambay	M.Tech B.Tech	VRCE Roorkee	1979 1977	Lecturer, Assistant Prof.	3/8/81		50	-	50	Total(08)	-	--	--		Power System protection
Dr (Mrs) N.R. Patne	Ph.D M.Tech B.Tech	VNIT VRCE Nagpur	2010 2000 1993	Lecturer, Assistant Prof.	18.5.2006		60	-	40	Journal (10) Conf. (12 Total(22)	-	--	--		Power System
Ashwin Dhabale	Ph.D. M.Tech B.E.	IISc IIT B Nag.Uni.	2016 2004 2002	Asst. Prof	May2006	0	50	0	50	Conf (02) Total (02)	0	Thesis submitted 2015	0	0	Control system
R.J. Satputaley	M.Tech B.E.	VNIT Nag.Uni.	2001 1998 2001	Asst. Prof	18.7.2008	0	60	0	40	Journal (5) Conf. (3) Total(08)	0	Yes-Ongoing at VNIT	0	0	Power Electronics Systems
Dr. M. M. Lokhande	Ph.D M.E. B.E.	IIT B GCOEP Nag. Uni.	2010 2003 2001	Asst. Prof	22/07/15	0	50	0	50	Jour(7) Conf(12) Total(19)	0	n/a	0	0	Power Electronics, Machine, Electric Vehicles, PV
Dr. R.K. Keshri	Ph.D M.Tech B.Sc(Engg)	UniPD, Italy NIT Jsr NIT Jsr	2014 2007 1994	Asst. Prof	14/08/15	0	20	20	60	Jour(4) Conf(14) Total(18)	0	n/a	0	1	Power Electronics and Drives for Electric Vehicles

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

STR is desired to be 15 or superior

Assessment = 20 × 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)
CAY (2014-2015)	102	101	93	296	18	16.44	18.03
CAYm1	94	94	99	287	18	15.94	18.81
CAYm2	94	99	99	292	20	14.6	20.54
Average Assessment							**19.12**

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

N = 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)
CAY	18	20	20
CAYm1	18	20	20
CAY m2	20	20	20

5.2. Faculty Cadre Ratio (20)

Assessment = 20 × CRI

where, CRI = Cadre ratio index

= 2.25 × (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

CAY	02	10	20	1.57	20
CAYm1	03	10	20	1.8	20
CAYm2	05	11	20	2.36	20
Average Assessment					**20**

5.3. Faculty Qualifications (30)

Assessment	=	3* FQI
Where CRI	=	Faculty Qualification Index
	=	$(10x+6y+4z_O)/N2$ Such that , $x+y+ z_O <= N2$; and $z_O <= z$
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

	x	*y*	*z*	N2	FQI	*Assessment*
CAY*m*2 2012-2013	15	4	0	20	8.7	26.1
CAY*m*1 2013-2014	13	4	0	20	7.7	23.1
CAY 2014-2015	15	4	0	20	8.7	26.1
Average assessment						**25.1**

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

Biography of faculty's correlation to programme curriculum are presented in **Annexure III**.

Name of the Faculty	Specialization
Prof. M. K. Khedkar	Power System Automation
Prof. M. V. Aware	Electric Drives, Power Electronics, High Voltage Engineering
Prof. H. M. Suryawanshi	Power Electronics,Electric Drives and Power System
Prof .S. R. Bhide	Power System Protection, Artificial Intelligence Techniques
Dr. B. S.Umre	Power System, Electrical Machines,Tortional Oscillations
Dr. V. B. Borghate	Power Electronics, Electrical Machine Design
Dr. (Mrs.)A. S. Junghare	Power System, Control System
Dr. P. S. Kulkarni	Power System Operation and Control, Renewable Energy Systems
Dr. M. R. Ramteke	Power Electronics
Dr. (Mrs.) M. A. Chaudhari	Power Electronics, Power Quality
Dr. S. S. Bhat	Power System Analysis
Dr.V. S. Kale	Power System Protection
Dr. M. S. Ballal	Power System, Condition Monitoring, Power Quality and metering
Dr.(Mrs.) N. R. Patne	Power System, Power Quality
Mrs. R. J. Satputaley	Power System, Power Quality, Power Electronics
Mr. A. Dhabale	Control System Electric Drives
Mr. S. R. Tambay	Power System Protection, Analysis, Dynamics and Modelling
Dr. M. M. Lokhande	Power Electronics, Machines, Photovoltaic System, Electric Vehicles
Dr.R. K. Keshri	Power Electronics and Drives for Electric Vehicles Propulation and Renewable

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

Participant/resource person in two week faculty development programme : 5 points
Participant/resource person in one week faculty development programme : 3 Points

	(max. 5 per faculty)		
Name of the faculty	**CAY (14-15)**	**CAY*m*1 (13-14)**	**CAYm2 (12-13)**
Dr. H. M. Suryawanshi	5	5	3

Prof.M.V.Aware	3	5	3
Dr. S.R Bhide	3		-
Dr. B.S Umre	5	5	
Dr.V.B.Borghate	-	-	3
Dr.(Mrs.)M.A.Chaudhari		3	3
Dr.P.S.Kulkarni	5	3	3
Dr.M.R.Ramteke	5	-	3
Dr. S. S. Bhat			3
Dr. V. S. Kale	5	-	5
Dr. M.S. Ballal	5	5	-
Dr. R.K. Keshri	-	3	-
Dr.M.M.Lokhande	5	3	-
Dr. A.S. Junghare	5	5	
Dr. N.R. Patne	-	5	-
R.J. Satputaley	-	5	-
Sum	46	47	26
N (Number of faculty positions required for an STR of 15)	20	20	20
Assessment = 3 × Sum/*N*	6.9	7.0	3.9
	Average assessment		**5.93**

5.6. Faculty Retention (15)

Assessment = $3 \times RPI/N$
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	CAY*m*2 2012-13	CAY*m*1 2013-14	CAY 2014-15
Number of faculty members with experience of less than 1 year (*x*0)	1	0	0
Number of faculty members with	0	1	0

1 to 2 years experience (x_1)			
Number of faculty members with 2 to 3 years experience (x_2)	0	0	1
Number of faculty members with 3 to 4 years experience (x_3)	0	0	0
Number of faculty members with 4 to 5 years experience (x_4)	0	0	0
Number of faculty members with more than 5 years experience ($x5$)	17	17	17
N	20	20	20
RPI = $x1$ + 2$x2$ + 3$x3$ + 4$x4$ + 5$x5$	85	86	87
Assessment3 × RPI/N	12.75	12.9	13.05
Average assessment			**12.9**

5.7. Faculty Research Publications (FRP) (20)

Assessment of FRP = 4 × (Sum of the research publication points scored by each faculty member)/N

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.

List of research publications are presented in **Annexure IV**

Name of the faculty (contributing to FRP)	**CAY*m*2**	**CAY*m*1**	**CAY**
	2012-13	**2013-14**	**2014-15**
Prof. M. V. Aware	05	05	05
Prof. H. M. Suryawanshi	05	05	05
Prof .S. R. Bhide	05	05	05
Prof. B. S.Umre	05	05	05
Prof. V. B. Borghate	03	03	05
Prof. A. S. Junghare	03	03	05
Prof. P. S. Kulkarni	05	05	05
Prof. M. R. Ramteke	05	05	03

Prof.M. A. Chaudhari	05	05	05
Prof. S. S. Bhat	00	05	05
Prof.V. S. Kale	03	05	05
Prof. M. S. Ballal	05	05	05
Prof. S. Pattnaik	05	03	03
Prof. N. R. Patne	03	05	03
Prof. R. J. Satputaley	05	05	03
Prof. A. Dhabale	02	03	03
Prof. S. R. Tambay	00	00	00
Sum	**64**	**72**	**70**
N (Number of faculty			
positions required for STR	20	20	20
of 15)			
Assessment of FRP = 4 × Sum/*N*	12.8	14.4	14
Average assessment	**13.73**		

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

Assessment of FIPR = 2 × (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 member (contributing to	FIPR points (max. 5 per faculty member)		
	CAY*m*2	**CAY*m*1**	**CAY**

FIPR)	2012-13	2013-14	2014-15
Prof. M. V. Aware	05		05
Prof. H. M. Suryawanshi	05	05	05
Prof. B. S.Umre			05
Prof. V. B. Borghate			05
Prof. M. S. Ballal	05	05	05
Sum	15	10	25
N	20	20	20
Assessment of FIPR = 2 × Sum/*N*	1.5	1	2.5
Average assessment			1.66

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

Assessment of R&D and consultancy projects = 4 × (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.

Prof. H. M. Suryawanshi

Sr. No.	Title of Project	Sponsored By	Outlay	Status
1.	Developments in Power Electronics (FIST-project)	DST 2009-14	**80.5**Lakhs	Completed
2.	Development of efficient converter for grid integration	DST 2015-18	**60.0** Lakhs	Ongoing
3.	Reliable and efficient system for community energy solution	DST-RCUK 2014-17	**42** Lakhs	Ongoing

Prof. M. V. Aware

Sr. No.	Title of Project	Sponsored By	Outlay	Status
1.	Analog fractional order PID controllers	BRNS 2009-12	**28** Lakhs	Completed
2.	Industrial digital fractional order controllers	BRNS 2013-15	**24** Lakhs	Ongoing

Prof. S. R. Bhide

Sr. No.	Title of Project	Sponsored By	Outlay	Status
1.	Augmentation of power system protection laboratory	DST 2009-14	**20**Lakhs	Completed

Dr. S.S. Bhat

Sr. No.	Title of Project	Sponsored By	Outlay	Status
1.	Surveillance for Gondia City	Gondia Police 2013-14	4 Lakhs	Completed
2.	Energy monitoring of street lights using wireless sensors	Centre of excellence TEQIP – II 2014-15	12.25 Lakhs	Ongoing

Dr. M. R. Ramteke

Sr. No.	Title of Project	Sponsored By	Outlay	Status
1.	Energy monitoring of street lights using wireless sensors	Centre of excellence TEQIP – II 2014-15	12.25 Lakhs	Ongoing

Dr. Mrs. A.S. Junghare

Sr. No.	Title of Project	Sponsored By	Outlay	Status
1	Industrial digital fractional order controllers	BRNS 2013-15	24 Lakhs	Ongoing

Dr. M.S. Ballal

Sr. No.	Title of Project	Sponsored By	Outlay	Status
1.	Development of efficient converter for grid integration	DST 2015-18	60.0 Lakhs	ongoing
2.	Mitigation of harmonics in induction motor	Haldiram International Pvt. Ltd. Nagpur	1.5 Lakhs	Ongoing

		2015-16		
3.	Condition monitoring of distribution transformer	Tesla transformer Bhopal 2015-16	1.71 Lakhs	Ongoing
4.	Error Compensation in Industrial Metering	Koyna Engineering Pvt. Ltd, Nashik 2015-16	1.74 Lakhs	Ongoing

Dr. V. S. Kale

Sr. No.	Title of Project	Sponsored By	Outlay	Status
1	Computer Networking	DST (FIST) 2009-14	10 Lakhs	completed

Name of faculty member (contributing to FPPC)	FRDC points (max. 5 per faculty member)		
	CAY*m*2 2012-13	**CAY*m*1 2013-14**	**CAY 2014-15**
Prof. M. V. Aware	05	05	05
Prof. H. M. Suryawanshi	05	05	05
Prof .S. R. Bhide	05	05	00
Dr. (Mrs.) A. S. Junghare		05	05
Dr. M. R. Ramteke			05
Dr. S. S. Bhat			05
Dr. V. S. Kale	05	05	
Mr. A. Dhabale	00		
Sum	20	25	25
N	20	20	20
Assessment of FRDC = 4 × Sum/*N*	04	5.0	5.0
Average assessment			**07**

5.10. Faculty Interaction with Outside World (10)

FIP = Faculty interaction points

Assessment = 2 × (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,

Details of Interactions with outside world are given in **Annexure V**

Name of faculty member (contributing to FIP)	FIP points		
	CAY*m*2 2012-13	**CAY*m*1 2013-14**	**CAY 2014-15**
Prof. H. M. Suryawanshi	05	05	05
Prof. M. V. Aware	05	5	0
Prof .S. R. Bhide	03	03	
Dr. B. S.Umre	03	03	05
Dr. V. B. Borghate	03	05	03
Dr. (Mrs.) A. S. Junghare	03	03	03
Dr. P. S. Kulkarni	05	03	03
Dr. M. R. Ramteke	05	03	05
Dr. (Mrs.) M. A. Chaudhari	05	05	03
Dr. S. S. Bhat	05	03	03
Dr. V. S. Kale	0	05	05
Dr. M. S. Ballal	05	03	03
Dr. S. Pattnaik	05	0	0
Dr. (Mrs.) N. R. Patne	03	03	03
Mrs. R. J. Satputaley	05	03	03
Mr. A. Dhabale	0	0	0
Mr. S. R. Tambay	0	0	0
Sum	60	52	44
N	20	20	20
Assessment of FIP = 2 × Sum/*N*	6	5.2	4.4
Average assessment			**5.2**

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

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

Room description	Usage	Shared/ exclusive	Capacity	Rooms equipped with PC, Internet, Book rack, meeting
No. Of Classrooms: 06	2nd to 4th year student	Shared	1 of 50 , 5 of 100	yes
Tutorial rooms: 06	2nd to 4th year	Shared	1 of 50 ,	yes

	student		5 of 100	
No. Of Seminar rooms: 02	2nd to 4th year student	Shared	1 of 50 , 5 of 100	yes
No. Of Meeting rooms: 01	For meeting	Exclusive	30	yes
No. Of Faculty rooms: 23	Faculty	Exclusive	01	yes

Room No.: PGE 1/24, EN 0/1, E 1/10, E1/8, EN 1/1, E1/4

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)

YES

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

Each classroom is well equipped with LCD projector, internet connection etc.

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

Class room are specious, well ventilated and clean.

6.2. Faculty Rooms in the Department (15)

6.2.1. Availability of individual faculty rooms (5)

Each faculty is having separate room.

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

YES

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

YES

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

The following table is required for the subsequent criteria.

Laboratory	Exclusive use	Space,	Number of	Quality of	Laboratory

description in the curriculum	/ shared	number of students	experiments	instruments	manuals
PE lab	Shared	25	8	good	yes
UG PC lab	Shared	25	8	good	yes
Machine Lab	Shared	25	8	good	yes
Protection lab	Shared	25	8	good	yes
Basic Electrical Lab	Shared	25	8	good	yes
Microprocessor Lab	Shared	25	8	good	yes
Control System Lab	Shared	25	8	good	yes
Network Lab	Shared	25	8	good	yes
Measurement Lab	Shared	25	8	good	yes
Electrical Workshop Lab	Shared	25	8	good	yes
High Voltage lab	Shared	25	8	good	yes

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

Yes

6.3.2. Availability of computing facilities in the department (5)

Yes

There are 60 computers in computer lab with licenced softwares.

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

Yes

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

Each batch consisting of 20 students

There are 4 subgroups within a batch

6.4. Technical Manpower Support in the Department (15)

Name of the Technical Staff	Designation (pay- scale)	Exclusive/ shared work	Date of Joining	Qualification		Other Technical skills granted	Responsibility
				At Joining	Now		
R. D. Pathak	Assistant 5200-20000	Assists in office work	15.5.1990	B. Com D. In Lib. Sc., Govt. Cert. In English/Hindi Typing 40 w.p.m	M S-CIT, Computer Course	Gov. Cert. In Electric Motor Repairing, Gov. Certificate in Motor & Armatures winding	All types of official work.
P. D. Jaronde	Sr. Lab Assistant	Lab work , Member of Various committees at Institute	20.1.1997	B. Sc. (PCM), M. Sc. (Maths),	One yr. Advanced Diploma In Comp. Software form Bombay Technical Board	1. ADCSSAA from Bombay Technical Board. 2. LINUX System Adm. 3. VB. Net Course. 4. Deputed to IITB, IITK, Kanpur for Technical Up-gradation.	In Charge PA & Projection System at Institute level
K. M. Manapure	Sr. Lab Assistant	Assists in Lab. Work	16.7.1999	H.S.S.C. , ITI in console operator cum program Assist.	Same as on joining		To handle and maintain the Lab. Equipment
T. F. Gour	Supporting Staff	Office & Lab work	13.8.1991	S.S.C.	Same as on joining		To handle and maintain the Lab. Equipment
V. P. Gudadhe	Supporting Staff	Office & Lab work	16.9.1981	IX th	Same as on joining		To handle and maintain the Lab. Equipment
S. D.	Supporting	Office &	7.10.90	S.S.C.	Same as		To handle

Sahakate	Staff	Lab work			on joining		and maintain the Lab. Equipment
P. T. Bante	Supporting Staff	Office & Lab work	14.1.94	S.S.C.	Same as on joining		To handle and maintain the Lab. Equipment

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

Laboratory description in the curriculum	Technical Supporting Staff
Power Electronics lab	Mr. S. D. Sahakate
Drives lab	Mr. Vishnu Gudadhe
Power System Analysis lab	Mr. Vishnu Gudadhe
Protection Lab	Mr. T. F. Gour
Basic Electrical Enginnering	K. M. Manapure

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

Skill-upgrade and professional advancement

- Professional/Technical Training
- Skill Developement program organised by Government of India
- Workshop: Knowledge about insulation and overall up-keep of electrical equipments
- Incentives
- Bonus
- Advances: Festival, Cycle
- Allowances: Clothes and washing

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

Students' Admission

Admission intake -UG (for information only)

Item	CAY 2015-16	CAYm1 2014-15	CAYm2 13-14	CAY CAYm3 12-13
Sanctioned Intake Strength in the Institute (N)	746	746	746	738
Number of students admitted on merit basis (N1)	708	722	701	713
Number of students admitted on management quota / **otherwise** (N2)	40 (DASA/ICCR/MEA)	38	30	48
Total number of admitted students in the Institute (N1+N2)	748	760	731	761

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)	2015-16	2014-15	2013-14	2012-13	2011-12	2010-11	2009-10
01	1-20000	387	425	403	410	436	411	367
02	20000-40000	155	115	138	136	137	130	105
03	40000-60000	43	47	32	49	30	47	29
04	60000-80000	39	37	33	48	38	38	36
05	80000-100000	25	18	18	27	37	29	22
06	100000-150000	30	39	45	21	19	26	25
07	150000-200000	13	19	07	8	12	10	14
08	200000-300000	07	10	11	9	6	4	11
09	300000-400000	05	05	07	1	3	4	1
10	400000-500000	01	01	02	1	2	3	0
11	500000-600000	01	03	01	2	1	2	0
12	600000-700000	01	01	03	1	1	0	0
13	Admitted without AIEEE ranks (foreign nationals)	40	38	30	48	15	45	53
	Total	**748**	**760**	**731**	**761**	**737**	**749**	**663**

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 (%)		
						1st year	UG	PG
1.	Dr. J.D. Ekhe	Ph.D	Professor	24/07/1996	Chemistry	--	50	50
2.	Dr. S.S. Umare	Ph.D	Professor	23/08/1996	Chemistry	21	31.7	47.3
3.	Dr. (Mrs.) Anupama Kumar	Ph.D	Associate Professor	06/01/2000	Chemistry	14.2	42.8	43
4.	Dr. Sujit Kumar Ghosh	Ph.D	Associate Professor	04/07/2012	Chemistry	--	--	100
5.	Dr. (Mrs.) Ramani V. Motghare	Ph.D.	Assistant Professor	17/05/2006	Chemistry	100	--	--
6.	Dr. Chayan Das	Ph.D/	Assistant Professor	30/05/2006	Chemistry	25	--	75
7.	Prof. Atul V. Wankhede	Ph.D/	Assistant Professor	26/05/2009	Chemistry	62.5	--	37.5
8.	Dr. Sangesh P. Zodape	Ph.D	Assistant Professor	02/04/2012	Chemistry	25	--	75
9.	Dr. Umesh Rohidas Pratap	Ph.D/M.Sc.	Assistant Professor	02/05/2012	Chemistry	62.5	--	37.5
10.	Dr. Susanth K. Nayak	Ph.D	Assistant Professor	20/01/2015	Chemistry	52	48	--
11.	Dr. S. Laxmi Gayatri	Ph.D	Assistant Professor	06/02/2015	Chemistry	53.8	--	46.2
12.	Dr. Abhishek Banerjee	Ph.D	Assistant Professor	18/06/2016	Chemistry	100	--	--
13.	Dr. Sandipan Haldar	Ph.D	Assistant Professor	23/06/2016	Chemistry	85	15	--
14.	Dr. V.K. Deshpande	Ph.D	Professor & Head	08/03/1988	Applied Physics	30	35	35
15.	Dr. R.S. Gedam	Ph.D	Associate Professor	28/08/1998	Applied Physics	20	45	35
16.	Dr. B.R. Snkapal	Ph.D	Associate Professor	10/05/2012	Applied Physics	--	--	100
17.	Dr. G. Hemachandra	Ph.D	Associate Professor	23/05/2012	Applied Physics	100	--	--
18.	Dr. (Mrs.) S.R.	Ph.D/M.S	Assistant	16/05/2006	Applied	70	--	30

	Patrikar	c.	Professor		Physics			
19.	Dr. (Mrs) A. V. Deshpande	Ph.D.	Assistant Professor	16/05/2006	Applied Physics	50	25	25
20.	Dr. (Mrs.) S.M. Giripunje	Ph.D	Assistant Professor	07/10/2008	Applied Physics	60	--	40
21.	Dr. K. Mohan Kant	Ph.D	Assistant Professor	14/06/2012	Applied Physics	30	--	70
22.	Dr. M.S. Ramkartik	Ph.D.	Assistant Professor	26/12/2014	Applied Physis	70	--	30
23.	Dr. Poorva Singh	Ph.D.	Assistant Professor	11/05/2015	Applied Physis	60	10	30
24.	Dr. Aviroop Das	Ph.D.	Adjunct Assistant Professor	01/08/2016	Applied Physis	100	--	--
25.	Dr. G.P. Singh	Ph.D.	Professor	27/03/1995	Mathematics	--	--	100
26.	Dr. P. Pramod Chakravarthy	Ph.D.	Associate Professor	31/05/2006	Mathematics	--	50	50
27.	Dr. M. Devakar	Ph.D.	Assistant Professor	24/11/2008	Mathematics	--	50	50
28.	Dr. Pallavi Mahale	Ph.D.	Assistant Professor	27/11/2008	Mathematics	--	50	50
29.	Dr. G. Naga Raju	Ph.D.	Assistant Professor	01/07/2010	Mathematics	50	--	50
30.	Dr. R. P. Pant	Ph.D.	Assistant Professor	25/07/2012	Mathematics	50	--	50
31.	Dr. Pradip Roul	Ph.D.	Assistant Professor	13/08/2012	Mathematics	50	--	50
32.	Dr. Deepesh Patel	Ph.D.	Assistant Professor	23/01/2015	Mathematics	50	--	50
33.	Dr. V V Awasthi	Ph.D.	Assistant Professor	19/07/2016	Mathematics	50	50	--
34.	Dr. Jyoti Singh	Ph.D.	Assistant Professor	22/07/2016	Mathematics	50	--	50
35.	Dr. Ashutosh Singh	Ph.D. thesis submitted	Adjunct Assistant Professor	01/08/2016	Mathematics	100	--	--
36.	Mr. Krishna Kumar	Ph.D.	Adjunct Assistant Professor	25/07/2016	Mathematics	100	--	--
37.	Mr. Anup Kumar Sharma	Ph.D. thesis submitted	Adjunct Assistant Professor	25/07/2016	Mathematics	--	100	--
38.	Mr. Dinesh Kumar	Ph.D. thesis submitted	Adjunct Assistant Professor	01/08/2016	Mathematics	50	50	--

39.	Mr. V. B. Borghate	Ph.D.	Professor	01/08/1985	Electrical Engg.	25.93	55.56	18.52
40.	B. S. Umre	Ph.D.	Associate Professor	02/07/1984	Electrical Engg.	14.82	74.7	11.11
41.	M. R. Ramteke	Ph.D.	Associate Professor	05/03/1995	Electrical Engg.	33.33	55.56	11.11
42.	A. S. Junghare	Ph.D.	Associate Professor	07/03/1995	Electrical Engg.	16.00	84.00	--
43.	S. R. Tambay	Ph.D.	Assistant Professor	03/08/1981	Electrical Engg.	7.41	2.96	29.62
44.	Prof. Mrs. R. J. Satputaley	M.Tech.	Assistant Professor	18/07/2008	Electrical Engg.	31.03	58.62	10.34
45.	Dr. A. Dhabaley	Ph.D.	Assistant Professor	16/05/2005	Electrical Engg.	27.59	44.83	27.59
46.	N. R. Patne	Ph.D.	Assistant Professor	18/05/2006	Electrical Engg.	31.03	68.96	--
47.	Dr. S. V. Bopshetty	Ph.D	Associate Professor	18/07/1980	Mech. Engg.	--	100	--
48.	Mr. A. A. Thakre	M.Tech.	Assistant Professor	03/08/2006	Mech. Engg.	50	50	50
49.	Mr. M. S. Kotambkar	M.Tech.	Assistant Professor	27/07/2006	Mech.Engg.	55	55	55
50.	Prof. D. A. Jolhe	M.Tech.	Assistant Professor	15/09/2008	Mech. Engg.	68	--	32
51.	Prof. N. K. Lature	M.Tech.	Assistant Professor	15/09/2008	Mech. Engg.	78	--	22
52.	Dr. T.V.K. Gupta	Ph.D.	Assistant Professor	16/12/2014	Mech. Engg.	78	--	22
53.	Prof. P. V. Kane	M.Tech.	Assistant Professor	02/12/2008	Mech. Engg.	--	100	--
54.	Dr. Trushar Gohil	Ph.D.	Assistant Professor	30/04/2015	Mech. Engg.	--	52	47
55.	Prof. Ravikumar Dumpala	Ph.D.	Assistant Professor	01/06/2015	Mech. Engg.	--	81	19
56.	Dr. L. M. Gupta	Ph.D.	Professor	18/10/1989	Applied Mechanics	20	20	60
57.	Dr. M. M. Mahajan	Ph.D.	Professor	18/08/1992	Applied Mechanics	--	53.8	46.2
58.	Dr. R. K. Ingle	Ph.D.	Professor	14/09/1992	Applied Mechanics	15.4	38.5	46.2
59.	Dr. G. N. Ronghe	Ph.D.	Professor	29/06/1987	Applied Mechanics	--	16.7	83.3
60.	Dr. O. R. Jaiswal	Ph.D.	Professor	30/10/1998	Applied Mechanics	22.2	55.6	22.2
61.	Dr. R. S.	Ph.D.	Associate	11/08/1992	Applied	--	37.5	62.5

	Sonparote		Professor		Mechanics			
62.	Dr. S. V. Bakre	Ph.D.	Associate Professor	16/05/2006	Applied Mechanics	--	58.3	41.7
63.	Dr. Sangeeta Gadve	Ph.D.	Associate Professor	08/06/2012	Applied Mechanics	--	58.3	41.7
64.	Dr. D. Datta	Ph.D.	Assistant Professor	15/06/2010	Applied Mechanics	23.1	38.5	38.5
65.	Dr. Ratnesh Kumar	Ph.D.	Assistant Professor	17/04/2012	Applied Mechanics	38.5	46.2	15.4
66.	Mr. S. B. Borghate	M.Tech.	Assistant Professor	30/08/1998	Applied Mechanics	56.3	31.3	12.5
67.	Mr. A. Y. Vyavhare	M.Tech.	Assistant Professor	14/06/2006	Applied Mechanics	--	57.1	42.9
68.	Mr. A. P. Khatri	M.Tech.	Assistant Professor	28/11/2008	Applied Mechanics	69.2	15.4	15.4
69.	Dr. M. D. Goel	Ph.D.	Assistant Professor	15/07/2016	Applied Mechanics	69.2	15.4	15.4
70.	Mr. M. Rahul	M.Tech.	Adjunct Professor	25/07/2016	Applied Mechanics	100	--	--
71.	Ms Rutuja Wanjari	M.Tech.	Adjunct Professor	25/07/2016	Applied Mechanics	100	--	--
72.	Mr. C S Chaudhary	M.Tech.	Adjunct Professor		Applied Mechanics	--	100	--
73.	Dr. M. Ghosal	Ph.D.	Associate Professor	16/08/1988	Humanities & S. Science	50	--	50
74.	Dr. G. N. Nimbarte	Ph.D.	Associate Professor	24/11/2008	Humanities & S. Science	100	--	--
75.	Navneet Utlawar	M.A.	Adjunct Assistant Professor	19/07/2013	Humanities & S. Science	100	--	--
76.	Mr. Jaipal	M.A.	Adjunct Assistant Professor	25/07/2016	Humanities & S. Science	100		
77.	Priyanka Bansod	M.A.	Teaching Assistant	15/07/2013	Humanities & S. Science	100	--	--
78.	A. S. Mokhade	M.Tech.	Associate Professor	23/08/1996	Computer Science & Engineering	84.62	15.38	--
79.	Mrs. Deepti Shrimankar	Ph.D.	Assistant Professor	26/11/2008	Computer Science & Engineering	28.57	71.43	--
80.	Dr. P.A. Sharma	Ph.D.	Assistant Professor	21/06/2015	Computer Science & Engineering	25	75	--
81.	Dr. Praveen Kumar	Ph.D	Assistant Professor	22/06/2016	Computer Science &	58.33	41.66	--

					Engineering			
82.	Mr. Bharat Kapse (Ad-hoc)	M.Tech.	Adjunct Assistant Professor	01/08/2016	Computer Science & Engineering	73.33	26.66	--
83.	Ms. Monali Ramteke	M.Tech.	Adjunct Assistant Professor	27/07/2016	Computer Science & Engineering	100	--	--

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(13-14)	731	22	33.23	4.51
CAYm1 (14-15)	760	24	31.67	4.74
CAY (15-16)	748	36	20.78	7.22
Average		27	28.56	5.49

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

Assessment of qualification = $3 \times (5x + 3y + 2z0)/N$, where $x + y + z0 \leq N$ and $z0 \leq Z$

x = Number of faculty members with PhD
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(13-14)	17	04	01	22	13.50
CAYm1 (14-15)	19	04	01	24	13.62
CAY (15-16)	27	08	01	36	13.42
Average Assessment of faculty qualification					13.51

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)

Lab Description	Space, Number of students	Type of Experiments	Quality of Instruments	Lab Manuals
Electrical Engg. Lab	100 Sqm	Practical Based	Good	Available in Lab

List of Experiment

1. To verify Kirchoff's law for d.c. circuit
2. To study B-H curve for ferrite and iron core material
3. To study RLC series circuit
4. To study RLC parallel circuit
5. To study 3- phase Y-Δ connected load
6. To find efficiency and regulation of transformer by direct loading
7. To study reversal of three phase Induction motor.
8. To study speed control of d.c. shunt motor.

7.1.4. Language laboratory (2) not related

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: Yes

Tutorial sheets provided: Yes

Tutorial classes taken by **faculty/teaching assistants**/

Number of tutorial classes per subject per week: 01

Number of students per tutorial class: 16

Number of subjects with tutorials: **1st year**

(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

A. Faculty Mentoring the freshly admitted students

Number of faculty mentors: 20

Number of students per mentor: 36

Frequency of meeting: Once a week

B. Students in III year mentoring freshly admitted students

Details of Student Mentor Programme at VNIT Nagpur , are given below:-

Student Mentor Programme Started in July 2013

The Student Mentor Programme (SMP) is a programme within the VNIT, Nagpur student community, with the following primary objectives of:

a. Enabling constructive interaction, guidance and mentorship of junior students by senior students.
b. Providing a reliable and comprehensive support system to motivate students to excel in both academic and non-academic fields and to make the most of their life at the Institute

Two way systems are devised to help freshman to be at ease with new environment of VNIT.

Structure of the SMP

This programme primarily deals with first year undergraduate students. The senior students, called Institute Student Mentors (ISMs) are responsible for helping a set of freshmen adjust to the new environment and subsequently monitor their progress throughout the year. Every undergraduate freshman is covered by this programme.

People involved in the Student Mentor Programme

Institute Student Mentor Programme:

The Body

1) Office of Dean Academics
2) Office of Students Welfare
3) Student Counselor/s
4) Medical Officer
5) Faculty Coordinators - One from each Discipline
6) Faculty Mentors from Basic Science Department
7) Alumni representation- Local.
8) Parent Representation: One Lady and One Gent

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

Feedback collected for all courses:- YES

Specify the feedback collection process:- The institute has a well designed feedback form which is given to all the students towards the end of every semester. The feedback form can be filled by the students without revealing their identity, if they so wish.

Percentage of students participating:- Nearly 70%
Specify the feedback analysis process:- Points scored by each teacher are totalled. Detailed comments are also compiled for the class as a whole, pertaining to the teacher and pertaining to the subject.

Basis of reward / corrective measures, if any :- Teachers are counselled by the Head of the Department based on the critical/negative feedback from the students. The important feedbacks related to the academic activity are discussed in the departmental meeting and appropriate suggestions are implemented. This normally results in the resolution of the problem. There is no system of awards.

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

1. Attending the Guest/Expert lectures
2. Using Audio Visual aids
3. Institute/Industrial visits
4. Internships
5. Attending conferences, delivering seminars
6. Participation in technical activities such as AXIS, PES

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

1. Access to digital resources such as e-books (5000 E-books), ieeexplorer, Science direct etc.
2. NPTEL
3. CDs from IITs on course material.
4. Expert Lectures.
5. Involvement in demonstration of newly purchased electrical equipments.

6. Visit to power installations and plants.
7. Distance Education program in collaboration with KRESIT, IIT, and Bombay is successfully running at this institute for more than a decade and has helped many students in augmenting their learning.
8. Virtual class room under NKN exists and it is hoped that it will help students in leveraging their self-learning process.

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)

1. Training and Placement Cell
2. Axis programme
3. Industrial visit
4. Meetings with industrial personnel
5. Demonstration and training of latest instruments/equipments
6. Guest lectures from industrial personnel are arranged in the department to motivate the students for entrepreneurship.
7. A special course on entrepreneurship is being taught by industrial person, which is fully supported by Active Alumni association.

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

Co-curricular and Extra Curricular activities (5)
(NCC , NSS , Cultural activities)

- Power Enginering Society
- Departmental Gathering
- Institute Gathering
- Axis
- Aarohi

Students conduct two events named as AXIS and Aarohi. These events are mainly managed by the students. A number of technical and cultural activates are conducted by the students.
Brief description of the two events is as follows:-

AXIS is a national-level technical festival held at the Visvesvaraya National Institute of Technology in Nagpur, India. One of the largest technical festivals in

India, the festival is organized annually at the end of September. Events at the festival include coding competitions (Cypher), architectural event (DEVISE), robotics event (Robotix), and paper presentations (Technodox).

Axis was first organized in 2004 after merging the two traditionally held technical festivals - the IEEE Expressions and Odyssey. Now it has gone on to become the 2nd largest technical festival in central India behind Prajwalan (biggest technical festival in Central India) with a combined participation of more than 3,000 participants from all over India with a combined budget of about Rs.2.5 million (as of 2009). Recently,[*when?*] the students have started a new guest lecture series under TED which is referred to as "TED x VNIT" and an initiative towards the environment called "SOW GREEN". Both of these are the integral part of AXIS from the year 2010.

Axis is an entirely student-organized fest organised by VNITians. The managers can be broadly categorized into two sections—The Core and Individual Event Managers. The events managers deal with the events that are conducted; like competitions, exhibitions, lectures, workshops. The Core deals with issues like accounts, infrastructure, marketing, hospitality, publicity and media.

Aarohi

Aarohi is the annual cultural festival (Cultfest) of Visvesvaraya National Institute of Technology, Nagpur, India. It is the most anticipated youth event of the year in Central India. It is a week long event organised every year, usually, during winter in February end. Students from all over the region take part in the events organised and gather in large numbers to witness the spectacles. Started by the pioneer batch of 1988 in VNIT [erstwhile VRCE (Visvesvaraya Regional College of Engineering)], the event continues to grow leaps and bounds each successive year.

Each year, Aarohi boasts of a multitude of participants in its various contests. The festival is completely student-organized and reputed firms sponsor the event each year. The main event runs for 3 days, while the elimination rounds for various contests begin a week in advance. Cultural Night acts as the curtain raiser and the proceeds of the event go to a charitable institute. Events include a Personality Contest, Singing, Quiz, Debate, Band Contest etc. This festival receives more than 3000 viewers every year.

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

Games and Sports Facilities and Qualified sports Instructors:-

The institute has following qualified sports instructors:-

Lecturer Physical Education:- Robin Simon

Lecturer Physical Education: Prashant Nagrale

Physical Education is a vital element in a comprehensive, well-balanced curriculum and can be a major contributing factor in the development of a human being in physical, emotional, mental and social domain of his/her life. It's importance can easily be understood from the definition itself which says Physical Education is an "Education through Physical and Education for Physical". This means that it is such a subject which educates the different areas of human behaviour to the people through physical activities of human being itself and on the other side which also educates the people how important are the physical activities for them to live their life effectively, efficiently, and joyfully.

Physical Education also provides an opportunity for students to develop critical life skills, such as problem solving, strategy, and working together. Many team games require participants to work together to achieve a goal. Students also learn the basics of good sportsmanship and that there is much more to sports and physical activities than simply winning or losing. Sports require training, mental and physical preparation, and help build self-confidence. 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.

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.

The faculties of Physical Education thus exploit all the possible dimensions of physical education & Sports through the variety of activities in our Institute:

01) The students are taken for regular games period where they play major sports such as Football, Volleyball, Cricket, Table Tennis, Badminton, Throw ball, Chess and Lawn Tennis.

02) Health club facilities are also provided to the students where they practice various health related Gymnasium activities in the allotted Morning and Evening hours under the guidance of a trained coach.

03) Sports medicine Research Lab: Physiological parameters related with physical fitness of staff and students are also examined through Sports Medicine Lab equipments. Suitable Physical Fitness programs are advised to the students as well as staff members of the institute after evaluating their physical fitness. Overweight and underweight students are also given appropriate weight gain and weight loss programs by the faculties of physical education.

04) Coaching facilities are also made available to the 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. Here the students they come in morning as well as in the evening hours for practice.

05) Another attractive sporting activity is the College Gathering which is organized every year by the students under the supervision of the Department of Physical Education. This is an event, where various inter-departmental Sports activities are conducted with overwhelming response and the participants are the whole Institute boys, girls and the complete Institute staff, including teaching and non-teaching. The winners and Runner ups are given certificates and trophies.

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. All the selected students are motivated by providing them with track suits and playing kits. Blazers are provided to all the student council members of the institute as a token of appreciation.

Participation in All India Inter NIT Tournaments:

More than 150 students participated in various All India Inter NIT Tournaments organized by various NITs in India.

Tournament organized by	Game	Duration	Total participants		Position
			Boys	Girls	
NIT Warangal	Volleyball	3rd to 5th of January 2014	12	12	Girls- 3rd Position
	Throw ball			12	Girls- 3rd Position
NIT Surathkal	Table Tennis	9th to 12th January 2014	4	3	Girls-Third
	Football		16	NA	Winner
	Kho-Kho		12	NA	
NIT Trichi	Athletics	9th to 12th of February 2014	10	4	Bronze Medal- 5000 Mtr. Women 4 X 400 Mtr.Relay- Silver Medal
	Badminton		5	3	Boys S/F
	Basketball		12	11	Women –S/F
	Cricket		15	NA	
	Chess		5	4	Men- Runner Up Women-Third Place
	Kabaddi		12	NA	S/F
	Lawn Tennis		4	NA	
NIT Rourkela	Athletics	23rd to 25th of January 2014	20	9	2 silver Medals & 3 Bronze Medals
NIT Allahabad	Cricket	13th to 15th of February 2015	15	0	S/F
NIT Agartala	Kho-Kho	19th to 21st February 2015	12	0	Winner
NIT Bhopal	Table Tennis	21st to 23rd of March 2015	4	3	Women - Runner up

NIT Kurukshetra	Volleyball	28th to 31st of March 2015	12	12	Participation
NIT Surat	Basketball	3rd to 5th of April 2015	12	12	Participation
	Badminton		5	0	Men- Individual event - Sahil Akhtar :- Winner
	Chess		5	5	Men- Third Position, Women- Runner Up
Total Participants			**85**	**41**	**126**

Local Tournaments:

The Institute also understands the importance of local tournaments and exposes the students in various local tournaments whenever it is possible as per the Academic Calendar. This year the Institute participated in Dr. Punjabrao Deshmukh Sports Festival in the disciplines of Cricket, Basketball and Football tournament.

Krik Mania:

This is an Invitational Cricket Tournament being organized since last 21 years by the Institute students under the guidance of the Physical Education section at local level.

Intramural and Krida Diwas:

It is very important to provide maximum participation to the student community in sports, to keep the overall atmosphere of the institute healthy and sporting. Through this event students get all the opportunities to interact with each other and explore their hidden talent in sports. With this point of view and to encourage sports, the Physical Education Section celebrates the birth anniversary of the great Hockey legend Major Dhyanchand on 29th of August every year. This year following sports were organized under Annual Intramural program: Football, Cricket, Basketball, Volleyball, Throw ball, Kho-Kho Table-Tennis, Badminton, Kabaddi and Chess. This year's Krida Diwas was inaugurated by honorable Director of the institute , all the students were given sweets on this occasion.

The objective of organizing such events in the campus is to involve the Engineering students in some physical activities and teach them sportsmanship, team spirit and help them in socialization through sports activities. The Biggest advantage of organizing such event, especially for the first year B. Tech. students is that every student of the first year

know each other and helps to provide solid platform for their healthy social relationship throughout their academic course. Through this unique program students also learn skills of organization, administration, officiating and coaching. All the class representative students also responded very enthusiastically and coordinated nicely amongst their classes for the success of the Intramural.

Medical examination:

Medical Examination is compulsory for all the first year B. Tech. /B. Arch. students in first semester itself. This examination is done by our Medical Officer Dr. S. Batra. and his team with the coordination of Department of Physical Education.

Physical Efficiency Test:

The Physical Efficiency of every first year B. Tech. / B. Arch. student is measured by applying suitable tests of Physical Fitness. Components such as abdominal strength, respiratory endurance, flexibility of hip joint & hamstring muscles and speed are measured in PET LEVEL 1. On the basis of overall performance of Level 1, selected students are allowed to participate in PET LEVEL 2, which is competitive in nature with higher degree of difficulties and performance base tests.

Felicitation of the students:

The Physical Education Section recognizes the efforts taken by first year students by felicitating them. The Honorable Director, Dr. N. Chaudhary was the chief guest for the valedictory function of the Annual Prize distribution held on 27th of March 2014; where as Dr. O. R. Jaiswal (Dean –Acd.) was the guest of honour. Dr. G. P. Singh (Dean –SW) was also present prominently along with other guests during the function.

- All the winners and Runner up teams are given the winner and runner up trophies, medals and certificates.
- Best CR Boy/Girl are awarded with memento and certificate where as certificates are awarded to rest of the CRs.
- Overall champion and Runner-up trophies are also awarded to the first two top scorer of the intramural tournament
- Best Sports person of the year: The best sports person of the year award was also given to Mr. Ravi Kumar who promoted Kho-Kho in the students of the institute for the past four years.

- First year participation in Inter NIT Tournament: 11 boys and 10 girls from B. Tech. B. Arch. First year were felicitated for representing the institute in various All India Inter NIT Tournaments.
- Coaches: All the coaches were also felicitated for rendering their services for improving the skills of various games.
- On the basis of overall performance of the Physical Efficiency Test, the first five best athletes each from boys and girls are selected which is shown in the following table.

Category	Name of the athlete	Section	Rank	Score out of 50
Boys	Prashant Iyer	T	1st	46.38
	Prasanjeet Jaiswal	Z	2nd	45.77
	Punit Magade	U	3rd	44.92
	Parishilan Rayamajhi	U	4th	44.68
	Sujeet Shinde	R	5th	44.40
Girls	Vidisha Uniyal	S	1st	46.65
	Payal Ukey	Arch.	2nd	45.96
	Ganta Nikhila	N	3rd	44.69
	Sapana Kumari Meena	R	4th	44.42
	Alisha Rath	R	5th	42.85

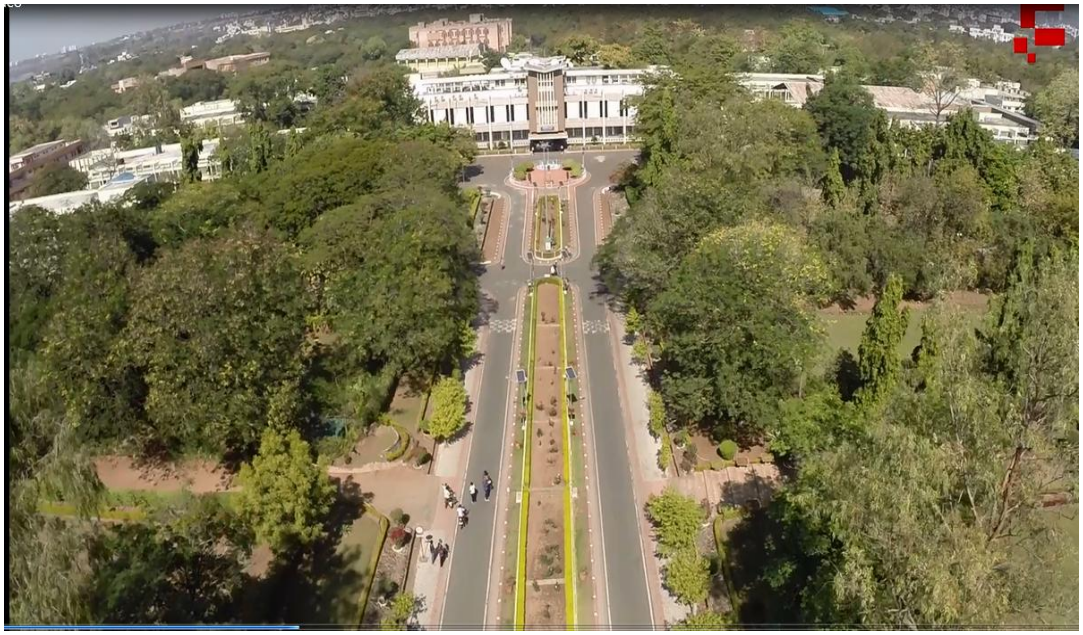
Sports facilities available on the Campus

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

- Indoor Badminton Stadium with four Wooden sprung Surfaced Badminton courts
- A big hall to accommodate at least 12 Table Tennis Tables
- A hall to practice Yoga
- Class room
- Sports Medicine Research Lab

8. Governance, Institutional Support and Financial Resources (75)
8.1. Campus Infrastructure and Facility (10)

8.1.A Campus



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 us 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.

Boys hostel:

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 18 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., 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, Excavation Engineering, Chemical Engineering. The Institute also offers M.Tech. by research program in all engineering departments, Ph.D.(Full/Part Time).

Institute has stared 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	7	2582	2211
Hostel for Girls	4	886	860

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 user 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)

(A) **Board of Governors**

S. N.	NAME	Designation
1.	**Mr. Vishram Jamdar,** **Industrialist,** Kinetic Gears E-19/1, MIDC Area, Hingna Road, Nagpur – 440 028	Chairman

2.	**Shri S P Goyal,** Joint Secretary Department of Higher Education, Ministry of HRD, Govt. of India, "C" Wing, Shastri Bhavan, NEW DELHI – 110 115	Member
3.	**Jr. Secretary & Financial Adviser (HRD),** Deptt. of Higher Education (IFD), 118-C, Shastri Bhawan, NEW DELHI – 110 115	Member
4.	**Shri Sanjeev Sharma,** Director NITs, MHRD, NEW DELHI – 110 115	Member
5.	**Shri Rajesh Singh,** Director, Deptt. of Higher Education (IFD), 118-C, Shastri Bhawan, NEW DELHI – 110 115	Member
6.	**Prof. (Ms.) Joyashree Roy,** Professor of Department of Economics, Jadavpur University, Kolkata, 11, Central Park, KOLKATA – 700 032	Member
7.	**Prof. S. C. Sahasrabudhe,** Director, Dhirubhai Ambani Institute of Information & Communication Technology, Gandhinagar, Near Indroda Circle, GANDHINAGAR – 382 007	Member
8.	**Prof. Uday N. Gaitonde,** Deptt. of Mechanical Engineering, Indian Institute of Technology, Bombay Powai, Mumbai – 400 076	Member
9.	**Dr. J. D. Ekhe,** Associate Professor, Department of Chemistry, VNIT, Nagpur	Member
10.	**Dr. Laxmikant M. Gupta** Professor, Department of Applied Mech., VNIT, Nagpur	Member
11.	**Dr. Narendra S. Chaudhari,** Director, VNIT, Nagpur	Member
12.	**Dr. S. R. Sathe** Registrar, V.N.I.T., Nagpur	Member-Secretary

(B) **Senate**

S. N.	Name	Design.
1	**Dr. Narendra S. Chaudhari**, Director, VNIT, Nagpur	Chairman

2	**Prof. Milind Atrey,** Professor and In-charge SINE, Department of Mechanical Engineering, IIT Bombay, Powai, MUMBAI – 400076	Member
3	**Dr. (Ms.) Kamal Singh,** Rtd. Vice-Chancellor of Amravati University Nelco Society, NAGPUR	Member
4	**Prof. Meenakshi Gupta,** Department of Humanities and Social Science, IIT Bombay, Powai, MUMBAI – 400076	Member
5	**Prof. O. R. Jaiswal** Dean (Academics), VNIT, Nagpur	Member
6	**Dr. S. R. Sathe** Dean (Planning & Development), VNIT, Nagpur	Member
7	**Dr. P. M. Padole** Dean (Faculty Welfare), VNIT, Nagpur	Member
8	**Dr. H. M. Suryawanshi** Dean (Research & Consultancy), VNIT, Nagpur	Member
9	**Dr. G. P. Singh** Dean (Students Welfare), VNIT, Nagpur	Member
10	**Dr. R. K. Ingle** Head, Deptt. of Applied Mechanics, VNIT, Nagpur	Member
11	**Prof. L. M. Gupta** Professor of Applied Mechanics, VNIT, Nagpur	Member
12	**Dr. M. M. Mahajan** Professor of Applied Mechanics, VNIT, Nagpur	Member
13	**Dr. G. N. Ronghe** Professor of Applied Mechanics, VNIT, Nagpur	Member
15	**Dr. V. K. Deshpande** Head, Deptt. of Applied Physics, VNIT, Nagpur	Member
16	**Dr. (Mrs.) Rajashree Kotharkar**, Head, Dept. of Architecture, VNIT, Nagpur	Member
17	**Dr. V. S. Adane** Professor of Architecture, VNIT, Nagpur	Member

18	**Dr. (Mrs.) Alpana Dongre,** Professor of Architecture, VNIT, Nagpur	Member
19	**Dr. K. L. Wasewar** Head, Chemical Engg. Deptt., VNIT, Nagpur	Member
20	**Dr. S. S. Umare** Head, Deptt. of Chemistry, VNIT, Nagpur	Member
21	**Dr. A. R. Tembhurkar** Head, Civil Engg. Deptt., VNIT, Nagpur	Member
22	**Dr. V. A. Mhaisalkar** Professor of Civil Engineering, VNIT, Nagpur	Member
23	**Dr. Rajesh Gupta** Professor of Civil Engineering, VNIT, Nagpur	Member
24	**Dr. Y. B. Katpatal** Professor of Civil Engg., VNIT, Nagpur	Member
25	**Dr. P. S. Deshpande** Professor of Computer Sc. & Engg., VNIT, Nagpur	Member
26	**Dr. M. V. Aware** Professor of Electrical Engg., VNIT, Nagpur	Member
27	**Dr. K. D. Kulat** Assciate Dean, Edu. Tech. and Library, VNIT, Nagpur	Member
28	**Dr. R. B. Deshmukh** Professor, Centre of VLSI and Nano Technology, VNIT, Nagpur	Member
29	**Dr. Avinash G. Keskar** Professor of Electronics Engg., VNIT, Nagpur	Member
30	**Dr. Rajendra M. Patrikar** Head of Electronics & Engg., VNIT, Nagpur	Member
31	**Dr. Abhay S. Gandhi** Head of Electronics Engineering, VNIT, Nagpur	Member
32	**Dr. Yogesh M. Deshpande,** Head, Deptt. of Humanities, VNIT, Nagpur	Member
33	**Dr. P. P. Chakravarthy** Head, Deptt. of Mathematics, VNIT, Nagpur	Member
34	**Dr. Shashikant B. Thombre** Professor. of Mechanical Engg., VNIT,	Member

	Nagpur	
35	**Dr. Animesh Chatterjee** Professor of Mechanical Engg., VNIT, Nagpur	Member
36	**Dr. N. R. Thote** Professor of Mining Engineering, VNIT, Nagpur	Member
37	**Dr. A. M. Kuthe** Head Mechanical Enggineering, VNIT, Nagpur	Member
38	**Dr. S. R. Bhide** Head, Deptt. of Electrical Engg., VNIT, Nagpur	Member
39	**Dr. D. R. Peshwe** Head, Deptt. of MMEl , VNIT, Nagpur	Member
40	**Dr. I. L. Muthreja** Head, Deptt. of Mining Engg., VNIT, Nagpur	Member
41	**Dr. K. M. Bhurchandi** Professor, Deptt., ECE, VNIT Nagpur	Member
42	**Dr. S. G. Sapate** Professor, Deptt. MME, VNIT Nagpur	Member
43	**Dr. A. P. Patil** Professor, Deptt., MME, VNIT, Nagpur	Member
44	**Dr. Manish Kurhekar** Assciate Dean, MIS Network and Website, VNIT, Nagpur	Member
45	**Dr. V.S. Kale** Assciate Dean, Electrical Works, VNIT, Nagpur	Member
46	**Dr. S.V. Bakre** Assciate Dean, Procurements and Stores, VNIT, Nagpur	Member
47	**Dr. P. S. Kulkarni** Assciate Dean, Exams, VNIT, Nagpur	Member
48	**Dr. R. S. Sonparote** Assciate Dean, Civil work, VNIT, Nagpur	Member
49	**Dr. Jatin Bhatt** Assciate Dean, T & P, VNIT, Nagpur	Member
50	**Dr. J. D. Ekhe** Assciate Dean, Students activity and Sports, VNIT, Nagpur	Member
51	**Dr. D. H. Lataye** Assciate Dean, Hostel Affairs, VNIT, Nagpur	Member

52	**Dr.Yogesh Deshpande** Assciate Dean, Public Relations, VNIT, Nagpur	Member
53	**Dr. V.R. Kalamkar** Assciate Dean, III Cell & Alumni Activities, VNIT, Nagpur	Member
54	**Dr. S. R. Sathe** Registrar, VNIT, Nagpur	Member-Secretary

(C) **Finance Committee**

S. N.	NAME	Designation
1.	**Mr. Vishram Jamdar,** **Industrialist,** Kinetic Gears E-19/1,MIDC Area,Hingna Road,Nagpur – 440 028	Chairman
2.	**Shri. S. P. Goyal** Joint Secretary , Department of Higher Education, Ministry of HRD, Govt. of India, "C" Wing, Shastri Bhavan, NEW DELHI – 110 115	Member
3.	Joint Secretary & Financial Advisor, (HRD), Ministry of HRD, Deptt. of Higher Education (IFD), 118-C, Shastri Bhawan, NEW DELHI – 110 115	Member
4.	**Shri Sanjeev Sharma,** Director NITs, MHRD, NEW DELHI – 110 115	Member
5.	**Shri Rajesh Singh,** Director, Deptt. of Higher Education (IFD), 118-C, Shastri Bhawan, **NEW DELHI – 110 115**	Member
6.	**Prof. S. C. Sahasrabudhe,** Director, Dhirubhai Ambani Institute of Information & Communication Technology, Gandhinagar, Near Indroda Circle, GANDHINAGAR – 382 007	Member
7.	**Prof. Uday N. Gaitonde,** Deptt. of Mechanical Engineering, Indian Institute of Technology, Bombay Powai, Mumbai – 400 076	Member
8.	**Dr. Narendra S. Chaudhari,**	Member

	Director, VNIT, Nagpur	
9.	**Dr. S. R. Sathe** Registrar, V.N.I.T., Nagpur	Secretary

(D) **Building & Works Committee**

S. N.	NAME	Designation
1.	**Dr. Narendra S. Chaudhari,** Director, VNIT, Nagpur	Chairman
2.	Addl. Secretary (HRD), Ministry of HRD, Deptt. of Higher Education (IFD), 118-C, Shastri Bhawan, NEW DELHI – 110 115	Member
3.	**Shri Sanjeev Sharma,** Director NITs, MHRD, NEW DELHI – 110 115	Member
4.	**Shri Rajesh Singh,** Director, Deptt. of Higher Education (IFD), 118-C, Shastri Bhawan, **NEW DELHI – 110 115**	Member
5.	**Prof. S. C. Sahasrabudhe,** Director, Dhirubhai Ambani Institute of Information & Communication Technology, Gandhinagar, Near Indroda Circle, GANDHINAGAR – 382 007	Member
6.	**Dr. R. R. Yerpude** **Dean (P&D),** V.N.I.T., Nagpur	Member
7.	**A. A. Sagne / Rajesh K. Khatke** **Chief Engineer, (Civil)** Public Works Department (PWD) Bandhkam Sankul, B.No.39/I, Civil Lines, NAGPUR – 440001	Member
8.	**R. R. Akulwar / V. N. Singne** **Supdt. Engineer (Electrical),** Public Works Department, Bandhkam Sankul, B.No.39/I, Civil Lines, NAGPUR – 440001	Member
9.	**Dr. S. R. Sathe** Registrar, V.N.I.T., 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: VNIT Nagpur has constituted Special Cell for faculty & staff. The regular meetings are conducted. To ascertain the Goal reservation policy is observed scrupulously.

2) Stores Purchase Committee: Stores Section is dealing with all kinds of Indigenous as well as Imported goods required for research purpose. There is centralized purchase procedure in the Institute. The procedure to be adopted for the purchase of diverse kind of equipments and stores required by the various users of the institute should be in consonance with the procedure approved by the BOG, of the Institute.

There is Stores Purchase Committee (SPC) constituted by the Competent Authority. All the purchases above the purchase value Rs.10,00,000/- (Rs. Ten Lakh Only) has to take the approval from the Stores Purchase Committee (SPC) before awarding the purchase order. Apart from the purchase activities, Stores Section also deals with the disposal/auction of the unserviceable materials after taking the approval of the Director in form GFR-17.

3) Grievance Cell: VNIT Nagpur has constituted Grievance Cell for faculty & staff. The regular meetings are conducted & the various Grievances of staff are addressed. The authority of the Institute is kept informed regarding Grievances & attempt is made to address the same. The Grievances is received from CPGRAMS are addressed online & the replies is provided.

4) Women's Cell: To address the Grievances related to sexual harassment of women and girl students of the Institute.

1) To celebrate the Women's Day in March each year.
2) To arrange workshops on health related issues.
3) To arrange workshop for general wellness of women.
4) To arrange talks on self defence'.
5) To arrange instructors to train girls/women for self protection.
6) To arrange camps on osteoporosis and distribution of free Calcium sachet provided by Health Centre.

No of meetings from 2012 to Dec. 2016 – Around 10 meetings conducted on various dates

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,	Dean (St. Welfare)	Upto 2 Lakhs

	including sports.		
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/consumabl -es/equipments directly related to Health Service expense.	Medical Officer	MO: upto Rs. 1 Lakhs in each case, with Celling 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	Registrar	Full power of [i] and Upto Rs. 2 Lakh

	for departments not covered above within allotted grant of the year.		
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. Rajendra Yerpude
* Dean (Faculty Welfare) -- Dr. P. M. Padole
* Dean (Research and consultancy) -- Dr. A. K. Chatterjee
* Dean (Academics) -- Dr. V. K. Deshpande
* Dean (Students Welfare) -- Dr. V. B. Borghate

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. S r. Sathe, Registrar
First Appellate Authority -- Dr. R. K. Ingle, HoD AM
Second Appellate Authority -- Dr. N. S. Chaudhari,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

Rs in lakhs

Item	Budgeted in CFY (2015-16)	Expenses in in CFY (2015-16)	Budgeted in CFY (2014-15)	Actual Expenses in CFY (2014-15)	Budgeted in CFY (2013-14)	Actual Expenses in CFY(2013-14)
Infrastructural built-up	12600.00	3411.18	10464.00	2808.48	5773.00	3303.08
Library	500.00	23.83	175.00	16.4	150.00	136.9
Laboratory equipment	3191.50	780.58	4031.00	583.07	2000.00	485.63
Stipend	1500.00	1591.16	-	-	-	-
Laboratory consumables	28.40	39.38	60.00	38.96	50.00	29.12
Teaching and non teaching staff salary	6536.05	6121.44	6185.00	5839.6	6005.00	5202.06
R&D	4631.51	2850.00	1256.00	1394.95	678.40	560.14
Training & travel	13.09	14.38	25.00	8.03	20.00	17.28
Other, specify	973.40	848.46	1340.50	853.23	1077.60	932.54
Total	**29973.95**	**15680.41**	**23536.05**	**11542.72**	**15754.00**	**10666.75**

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 fund 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 budget is utilized based on the project priority. Accommodation of students and faculty has been accorded top priority besides creating academic infrastructure (class

rooms, laboratories etc.) as the sudden increase in students' intake necessitated the creation of more hostels and faculty residences.

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**):

Item	Budgeted in CFY 2015-16 as on 31 Dec. 15	Budgeted in CFY 2014-15	Actual Expenses in CFY 2014-15	Budgeted in CFY 2013-14	Actual Expenses in CFY 2013-14	Budgeted in CFYm 2012-13	Actual Expenses in 2012-13
Laboratory equipment							
Software							
R&D							
Laboratory consumables							
Maintenance and spares							
Training & travel							
Miscellaneous expenses for academic activities							
Total							

* 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.

(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.)

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^2

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, 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)**

Year	**Number of new titles added**	**Number of new editions added**	**Number of new volumes added**
CAYm2 2012-13	1060	1060	6049
CAYm1 2013-14	1398	1398	4953
CAYm 2014-15	369	0369	1056
CAYm 2015-16	2630	2630	260

SUBJECT WISE TITLE (TILL 31ST MARCH 2012)

Sr.No.	Subject	Title	Volume
01.	Applied Mech.	355	605
02.	Architecture	5154	8937
03.	Chemical	2512	4352
04.	Chemistry	3182	6398
05.	Civil	8667	15016
06.	Computer Sci.	7990	11286
07.	Electronics	5093	8347
08.	Electrical	6475	14130
09.	Humanities	1476	2307
10.	Maths	3176	5911
11.	Mechanical	7055	13710
12.	Metallurgy	6193	9526
13.	Mining	4661	6461
14.	Physics	1793	6665
15.	L.S. & H.	155	155
TOTAL		**63937**	**113806**

SUBJECT WISE TITLES (TILL 31ST MARCH 2013)

Sr.No.	Subject	Title	Volume
01.	Applied Mech.	440	2176
02.	Architecture	5265	9350
03.	Chemical	2634	4986
04.	Chemistry	3261	8079
05.	Civil	8780	15730
06.	Computer Sci.	8079	14130
07.	Electronics	5267	9962
08.	Electrical	6531	15165
09.	Humanities	1488	2744
10.	Maths	3236	6548
11.	Mechanical	7118	14449
12.	Metallurgy	6239	10114
13.	Mining	4676	6856
14.	Physics	1806	7145
15.	L.S. & H.	177	177
TOTAL		**64997**	**127311**

SUBJECT WISE TITLES (TILL 31ST MARCH 2014)

Sr.No.	Subject	Title	Volume
01.	Applied Mech.	481	2297
02.	Architecture	5406	9804
03.	Chemical	2679	5158
04.	Chemistry	3397	8797
05.	Civil	8849	15951
06.	Computer Sci.	8140	14471
07.	Electronics	5363	10143
08.	Electrical	6628	16014
09.	Humanities	1748	3037
10.	Maths	3263	6622
11.	Mechanical	7196	14945
12.	Metallurgy	6293	10489
13.	Mining	4707	6911
14.	Physics	1874	7307
15.	L.S. & H.	371	390
TOTAL		**66,395**	**1,32,336**

SUBJECT WISE TITLES (TILL 31ST MARCH 2015)

Sr.No.	Subject	Title	Volume
01.	Applied Mech.	496	2333
02.	Architecture	5418	9862
03.	Chemical	2705	5201
04.	Chemistry	3409	8820
05.	Civil	8876	15978
06.	Computer Sci.	8172	14669
07.	Electronics	5372	10152

08.	Electrical	6644	16250
09.	Humanities	1782	3140
10.	Maths	3265	6624
11.	Mechanical	7212	14962
12.	Metallurgy	6303	10512
13.	Mining	4708	6912
14.	Physics	1878	7320
15.	L.S. & H.	524	657
TOTAL		**66,764**	**1,33,392**

SUBJECT WISE TITLES (TILL 31ST MARCH 2016)

Sr.No.	Subject	Title	Volume
01.	Applied Mech.	496	2333
02.	Architecture	5418	9862
03.	Chemical	2705	5201
04.	Chemistry	3409	8820
05.	Civil	8876	15978
06.	Computer Sci.	8188	14693
07.	Electronics	5373	10172
08.	Electrical	6644	16250
09.	Humanities	1782	3140
10.	Maths	3265	6624
11.	Mechanical	7212	14962
12.	Metallurgy	6303	10512
13.	Mining	4708	6912
14.	Physics	1878	7320
15.	L.S. & H.	524	657
TOTAL		**66781**	**133436**

8.5.3 Scholarly journal subscription (3)

Details		CFY 2016	CFY1 2015	CFYm2 2014	CFY m3 2013
Science	As soft copy	--	41	41	41
	As hard copy	--	13	15	12
Engg. And Tech.	As soft copy	2559	1757	358	736
	As hard copy	33	38	48	57
Architecture	As soft copy	Nil	00	00	00
	As hard copy	Nil	16	15	16

(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	
CFYm3 2012	53.32 Lacs (5112)	49,73,906.00	1,56,054.00		
CFYm2 2013	97.82 Lacs (13505	21,61,376.00	60,62,510.00		
CFYm1 2014	82.14 Lacs	24,95,955.00	84,80,762.00		
CFY 2015	9.60 Lacs	21,31,141.00	7,03,873.00		
CFY 2016	1.00 Lac	12933.00	12754705.00		

Virtual Class Room:

DETAILS ;-

Money Given By National Informatics Center (NIC);-

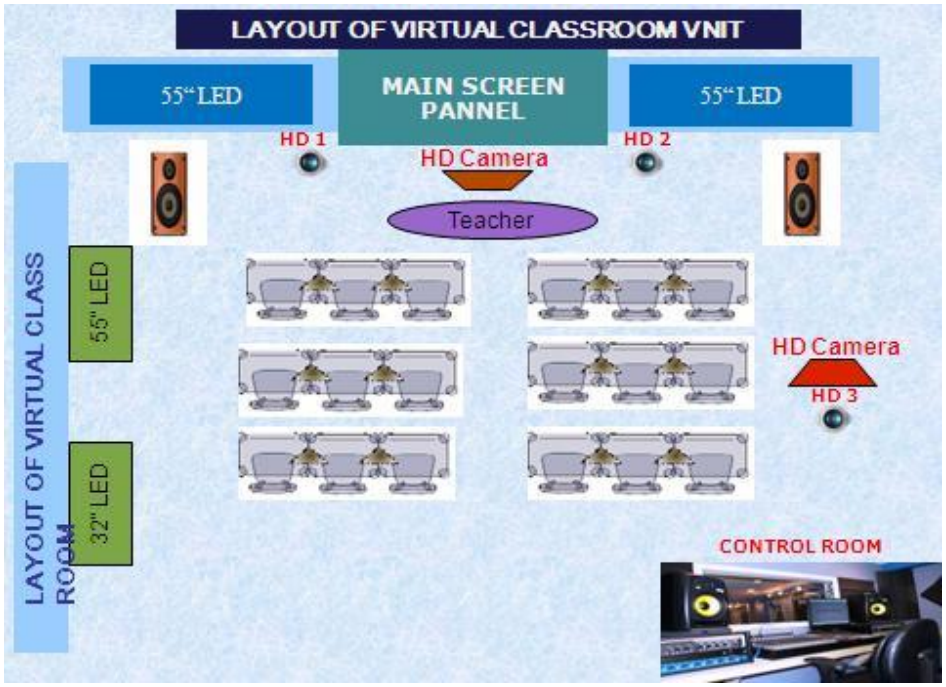
- Total Project Cost of Virtual Class-Room -- Rs. 32,26,524/-
- Civil Work for Virtual Class Room -- Rs.10,00,000/-
- Technical Assistant for Virtual Class Room -- Rs. 1,80,000/-
- Bandwith;-

Speed for Video only 50 mbps
Speed for net only 50 mbps
Total Bandwidth 100 mbps

- Portal of NKH 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. Incubation facility (5)

(Instruction: Specify the details of incubation facility in terms of capacity, utilisation terms and conditions, usage by students)

Center for Innovation- VNIT Nagpur (CIVN), a section 25 (non-profit) company is set up to promote innovation and entrepreneurship by converting and translating technology ideas and innovation in various disciplines of science and engineering into products, processes and services for commercial exploitation and the benefit of society.

Thus, CIVN came into existence in 2012 to administer the technology incubator and accelerate the growth of entrepreneurship in VNIT campus and people of the region.

CIVN under assistance of Rajiv Gandhi Science and Technology Commission Government of Maharashtra (RGSTC) runs and manages a Technology Incubator (TI) at VNIT, Nagpur to facilitate incubation of new enterprises with innovative technologies by admitting them in TI and providing them physical, technical and networking supports and services.

VNIT has been carrying research in cutting edge technologies which have potential to generate large amount of wealth, provided the gap between research and commercialization of the research output is bridged. Center for Innovation is able to address this gap by providing platform for the entrepreneurs to setup high wealth generating industries in Maharashtra using such cutting edge research.

Industry Institute Interaction Cell (III) at VNIT has been active since inception in 1993. It has established linkages with local industry, industry associations, and Govt. Departments in the promotion of technology. The technology developed in the laboratories can be used for development of new products and services.

VNIT would like to support a thriving and knowledge based business community in the Vidarbha area. We expect CIVN to produce responsible business enterprises and entrepreneurial leadership that will not only make a valuable contribution to the local economy, but also increase awareness in the region about a highly productive carrier option available.

The concept has already been accepted for implementation by the Governing Body of the Institute. A beginning has already been made in Electronics Engineering Deptt. and other departments shall follow soon. The basic details as currently approved are as follows:

Good infrastructure with common office facilities, computers, internet access, Shared facilities such as printing, photocopying, faxing, and scanning, well laid out entry and exit policies for tenant companies.

- Involvement, commitment and full cooperation from host institute and other stake holders.
- Experts for core technical guidance and assistance.
- Labs and technical facilities for prototype development.
- Assessment of Techno-commercial Viability of Proposals Received and proper mentoring.
- IPR and Legal Advice through a panel of specialist legal advisers identified for the purpose to help the prospective entrepreneurs.
- The centre proposes to tie-up incubating companies with reputed bankers and venture capitalists for mobilizing finances through Banks/Venture Capitalists/Angel Investors.
- Skill Development Programs for Managing Business activity shall be carried out by VNIT, other training institutes and individual experts as deemed fit.

8.7 Internet (5)

- Name of the Internet provider: BSNL ,Vodafone,NKN
- Available bandwidth: Leased Line
- Access speed: 1 Gbps and 170Mbps(BSNL+Vodafone): 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.)

8.7.1 Network Center Information;-

- The Network Centre (NC) primarily caters to the Internet Access requirements throughout the institute that includes Departments, Sections, Centers, Main Administrative Building, Hostels, Guest House, and CDEEP. Connectivity is also provided to remote locations like the Health Center, Security Cameras installed on the Gates, Quarter Wi-Fi network, etc. The institute has a Campus-wide fiber optic gigabit network with High End Central Core switch at the Network Centre.

- VNIT is a member of the National Knowledge Network (NKN) of the Government of India through which connectivity of 1 Gbps is provisioned. The internet access to the institute is also available from various service providers, through which the bandwidth available is around 170 Mbps.
- The Network Centre manages the annual maintenance of the desktops of the entire institute. It also operates and maintains the well-equipped Online Virtual Classroom created under the NKN project.
- The Network Centre has developed and is maintaining the institute and department websites. The Network Centre also manages institute mail server and provide e-mail services to all staff and students.
- The Network Centre has a Cisco Servers,10 Blades. Various Servers like Web Server, Mail Server, Proxy servers, DNS Servers, etc. are hosted.
- VNIT 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 has hardware such as core switch, blade chasis, 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 Processo

8.7.2 Physical Layout of Fiber Optic Cable of VNIT

Figure I

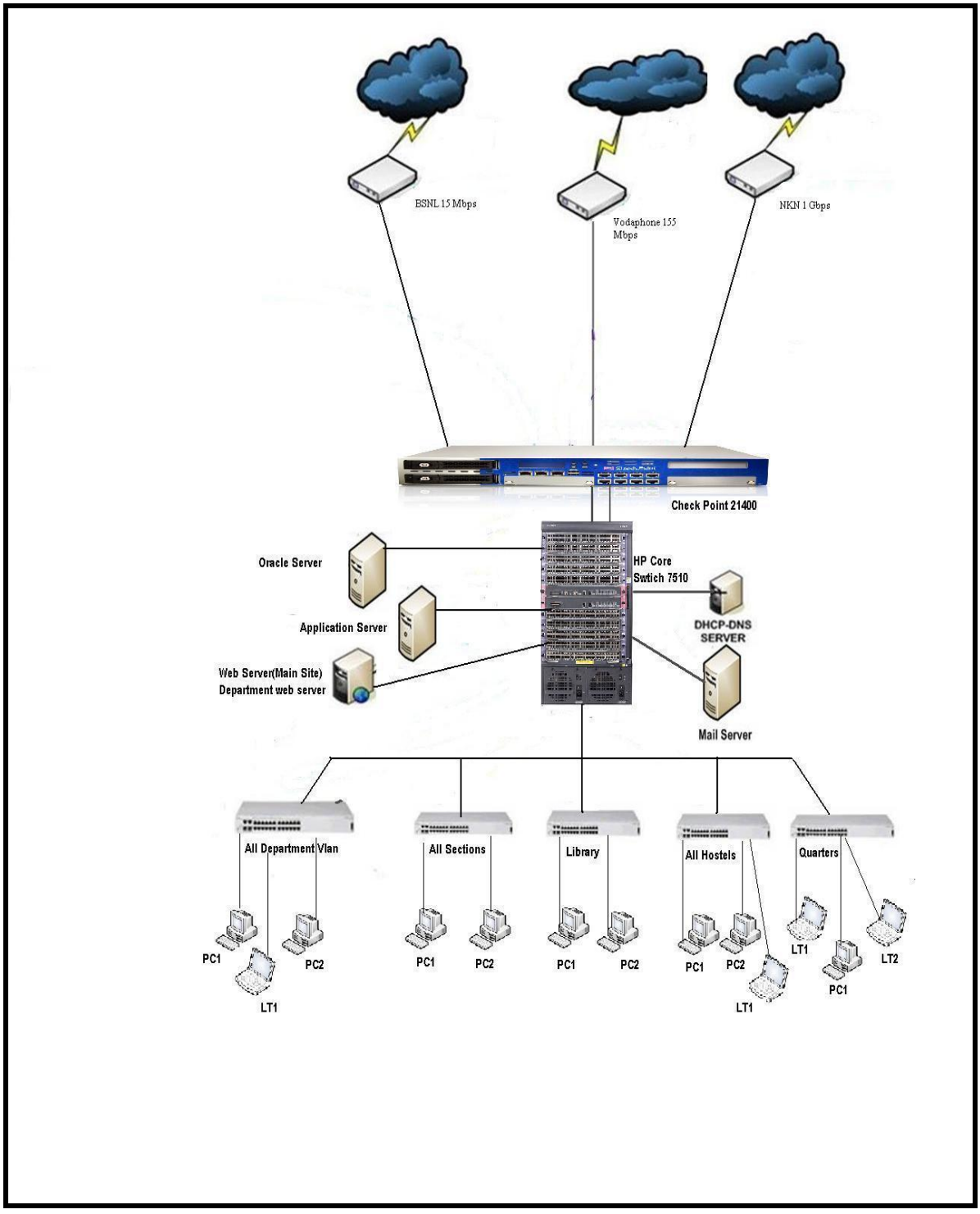
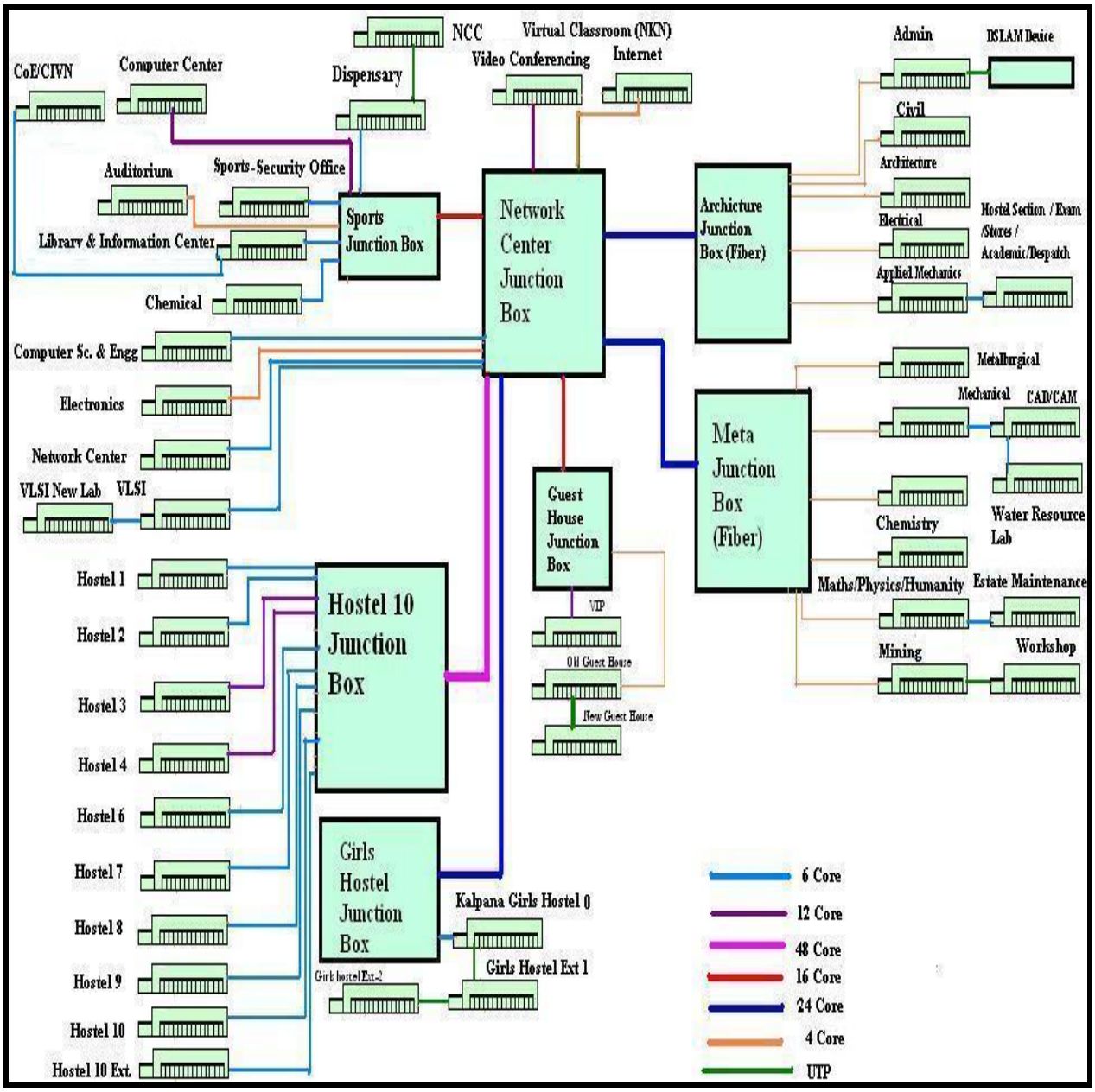

BSNL 15 Mbps
Vodaphone 155 Mbps
NKN 1 Gbps
Check Point 21400
Oracle Server
Application Server
Web Server(Main Site)
Department web server
HP Core Swtich 7510
DHCP-DNS SERVER
Mail Server
All Department Vlan
All Sections
Library
All Hostels
Quarters
PC1
PC2
LT1
LT2

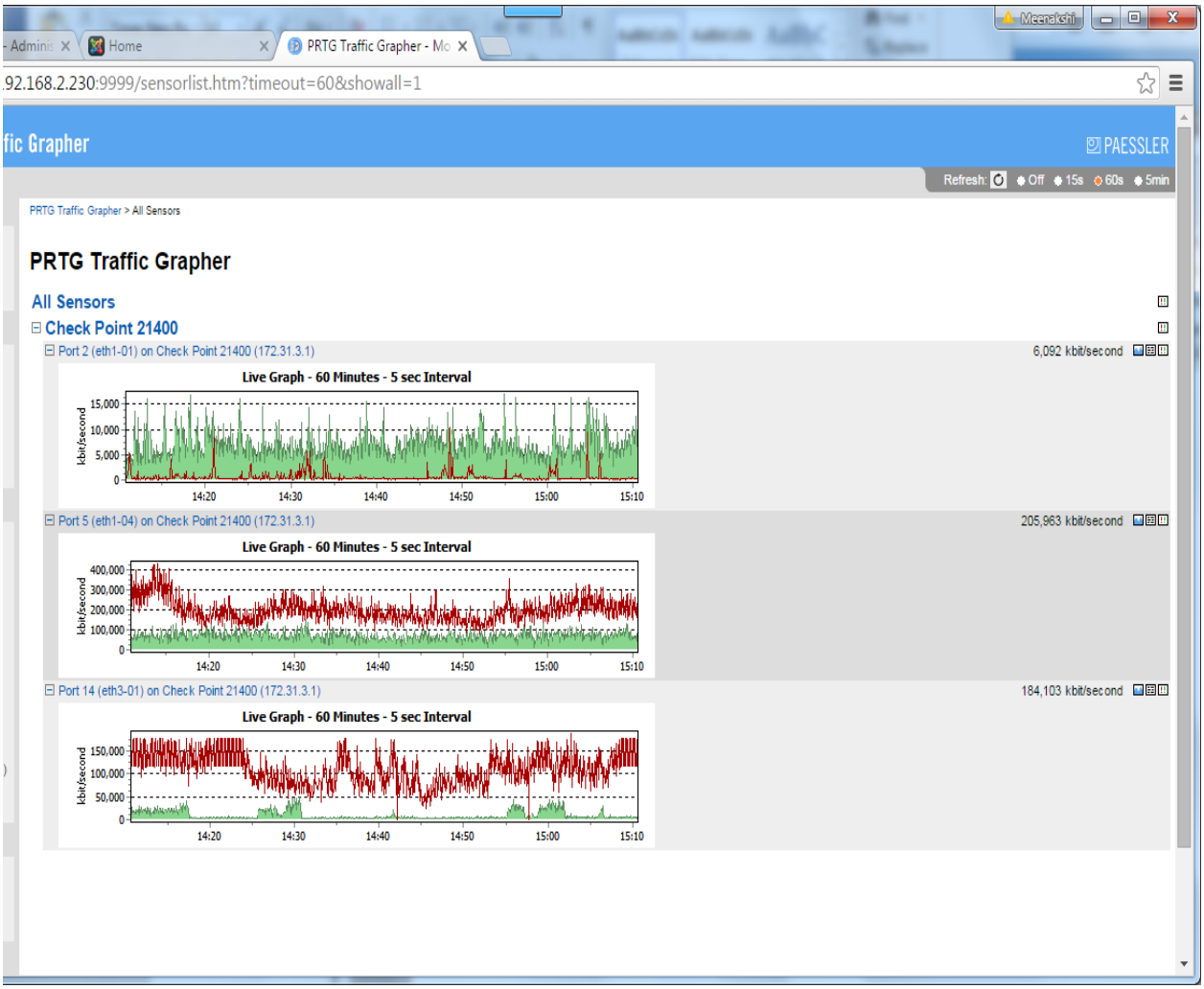
Figure II B


NCC
Virtual Classroom (NKN)
Video Conferencing
Internet
Admin
ISLAM Deice
CoE/CIVN
Computer Center
Dispensary
Civil
Auditorium
Sports-Security Office
Architecture
Sports Junction Box
Network Center Junction Box
Archicture Junction Box (Fiber)
Electrical
Hostel Section / Exam /Stores / Academic/Despatch
Library & Information Center
Applied Mechanics
Chemical
Computer Sc. & Engg
Metallurgical
Electronics
Mechanical
CAD/CAM
Meta Junction Box (Fiber)
Network Center
VLSI New Lab
VLSI
Guest House Junction Box
Water Resource Lab
Chemistry
Hostel 1
Hostel 10 Junction Box
VIP
Maths/Physics/Humanity
Estate Maintenance
Hostel 2
Old Guest House
Mining
Workshop
Hostel 3
New Guest House
Hostel 4
Hostel 6
Girls Hostel Junction Box
Hostel 7
Kalpana Girls Hostel 0
Hostel 8
Girls Hostel Ext 1
Hostel 9
Girls hostel Ext-2
Hostel 10
Hostel 10 Ext.
6 Core
12 Core
48 Core
16 Core
24 Core
4 Core
UTP

Physical Layout of Fiber Optic cable of VNIT Campus

8.7.3 PRTG Traffic Grapher

Figure III



8.8 Safety Norms and Checks (5)

8.8.1. 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

8.8.2. Fire - fighting measures: 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.

240 fire extinguishers of different types (CO2 , W/C, DCP , Foam) and capacity (2 kg , 4.5 kg , 5 kg ,6.5 kg and 10 kg, 9 Ltrs and 50 Ltrs) all over the Institute were installed after thorough inspection and fire safety audit by Mr. HT Chaudhary, Fire Advisor & Chief fire officer (Maharashtra State power Generation Company Limited).

Some new buildings which have recently come up are to be equipped with Fire extinguishing facilities. This is in process after specialist advice by Fire Advisor.

Regular refilling is done after expiry date and of the empty cylinders used in incidents.

Institute has engaged services of security agency which have their own training centre and are provide trained guards. Regular refresher training is also provided in security section by the security agency for effective fire extinguishing preparedness.

Institute had completed the formalities of mobile fire extinguisher (bike mounted) to effectively deal with all types of fire at any place in the Campus. However the procurement could not be completed but will be procured for better fire safety.

Need cropping up from time to time is taken care of viz. fire extinguisher CO 2 Type; 4.5 kg capacity has been installed in EDA lab in November 2015.

8.8.3. Safety of civil structure (1)

Being a publicly 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 In-charge 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

8.8.4. 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.)

8.9 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.)

8.9.1 Medical Care:

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

Institute through its health centre provides preventive, primitives & curative health services to the students, employees & their families. Resident doctor on campus & 24 x 7. Availability of ambulance services to 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 Homeopath available. Referral for Ayurvedic services is available. Physiotherapy services promote fitness & address sports related problems.

Speciality Clinics for eyes & skin problems is available. Mental health services are provides though counsellors & Psychiatrist. First aid facility is provided at all hostels.

8.9.2 Games and Sports-General

Research indicates that regular physical education, included in curriculum, produces physical, psychological, and intellectual benefits. Physical education may help prevent degenerative disease, improve overall physical condition, maintain emotional balance, promote a sense of social effectiveness, contribute to academic performance, and establish positive recreation habits. Therefore, physical education must be supported as an integral part of comprehensive education.

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.

Further, excellence in sports enhances the sense of achievements, national pride and patriotism. Sports being practical way of education facilitate beneficial recreation, improve productivity, foster social harmony inculcating sense of discipline and dedication in general life. Sports give a strong message of peace, friendship and understanding among the people of participants. Today, sports are prime need in a civilized society, as it helps to promote national integration, emotional integrity and professional intellect among the participants.

According to UNESCO General Conference (1978) Article 1; which advocates that practice of physical education and sport is a fundamental right for all:

Every human being has a fundamental right of access to physical education and sport, which are essential for the full development of his personality. The freedom to develop physical, intellectual and moral powers through physical education and sport must be guaranteed both within the educational system and in other aspects of social life.

Every one must have full opportunities, in accordance with his national tradition of sport, for practicing physical education and sport, developing his physical fitness and attaining a level of achievement in sport which corresponds to his gifts.

The Article 2; further endorse that Physical education and sport form an essential element of lifelong education in the overall education system:

2.1 Physical education and sport, as an practice of sports must be ensured throughout life by means of a global, lifelong and democratized education.

2.2 At the individual level, physical education and sport contribute to the essential dimension of education and culture, must develop the abilities, will-power and self-discipline of every human being as a fully integrated member of society. The continuity of physical activity and the maintenance and improvement of health, provide a wholesome leisure-time occupation and enable man to overcome the drawbacks of modern living. At the community level, they enrich social relations and develop fair play, which is essential not only to sport itself but also to life in society.

2.3 Every overall education system must assign the requisite place and importance to physical education and sport in order to establish a balance and strengthen links between physical activities and other components of education.

National Institutions play a major role in physical education and sport.

It is essential that public authorities at all levels and specialized non-governmental bodies encourage those physical education and sport activities whose educational value is most evident. Their action shall consist enforcing legislation and regulations, providing material assistance and adopting all other measures of encouragement, stimulation and control. The public authorities will also ensure that such fiscal measures are adopted as may encourage these activities.

It is incumbent on all institutions responsible for physical education and sport to promote a consistent, overall and decentralized plan of action in the framework of lifelong education so as to allow for continuity and co-ordination between compulsory physical activities and those practiced freely and spontaneously.

Thus in tune with above ideology, the faculties of Physical Education at this institute exploit all the possible dimensions of physical education & sports through the variety of activities in our Institute:

01) Physical Education is an audit course at the institute and they are taught sports skills, strategic preparation, and tactical preparation. Faculties of physical education work to increase the physical fitness of first year students (more than 750 in number) through various physical fitness programs. Apart from this teaching on play fields, they are also taught Physiological, Psychological, Sociological and Emotional aspects associated with sports and physical activities through talks and seminars.

02) Health club facilities are also provided to the students where they practice various health related Gymnasium activities in the allotted Morning and Evening hours under the guidance of a trained coach.

03) Sports medicine Research Lab: Physiological parameters related with physical fitness of staff and students are also examined through Sports Medicine Lab equipments. Suitable Physical Fitness programs are advised to the students as well as staff members of the institute after evaluating their physical fitness. Overweight and underweight students are also given appropriate weight gain and weight loss programs by the faculties of physical education.

04) Coaching facilities are also made available to the students selected by conducting the selection trials of various games. Specialized Coaches are appointed to train the students going to participate in various in Inter-NIT Tournaments.

05) Another attractive sporting activity is the Institute Gathering which is organized every year by the students under the supervision of the Physical Education section. This is an event, where various inter-departmental sports activities are conducted with overwhelming response where the participants are students institute teaching and non-teaching staff.

Participation of students in different games

The Institute encourages the students by exposing them to various Inter-NIT tournaments and also in local inter-collegiate tournaments. All the selected students are motivated by providing them with track suits and playing kits. Blazers are provided to all the student council members of the institute as a token of appreciation

Participation in All India Inter NIT Tournaments:

Through All India Inter NIT Tournament a student can exhibit his/ her talent in front of students of all the NITs in India. This year total 126 students, 85(M) & 41 (W)

participated in various All India Inter NIT Tournaments organized by various NITs in India. The following table shows the detail of participation by the institute in various All India Inter NIT Tournament organized by various NITs in India during the year 2014-15.

Sr. No	Game	Tournament organized by	Duration	Total participants		Position
				Men	Women	
1.	Athletics	NIT Rourkela	23rd to 25th of January 2014	20	9	2 silver Medals & 3 Bronze Medals
2.	Cricket	NIT Allahabad	13th to 15th of February 2015	15	0	S/F
3.	Kho-Kho	NIT Agartala	19th to 21st February 2015	12	0	Winner
4.	Table Tennis	NIT Bhopal	21st to 23rd of March 2015	4	3	Women - Runner up
5.	Volleyball	NIT Kurukshetra	28th to 31st of March 2015	12	12	Participation
6.	Basketball	NIT Surat	3rd to 5th of April 2015	12	12	Participation
7.	Badminton			5	0	Men- Individual event - Sahil Akhtar :- Winner
8.	Chess			5	5	Men- Third Position, Women- Runner Up
Total Participants				85	41	126

Local Tournaments:

The Institute also understands the importance of local tournaments and exposes the students in various local tournaments whenever it is possible as per the Academic Calendar. This year the Institute participated in Dr. Punjabrao Deshmukh Sports Festival in the disciplines of Cricket, Basketball and Football tournament.

Krik Mania:

Through this Invitational 50 limited over Cricket Tournament a platform is provided to the upcoming Cricketers of local colleges. Since last 22 years through this particular event students of the institute are learning various skills of organizing a sporting event under the guidance of Physical Education department. In present edition of Krik Mania Dr. Ambedkar College, Nagpur won the tournament by defeating the Dhanwate National College, Nagpur where as our institute team reached up to S/F.

Intramural and Krida Diwas(National Sports Day):

It is very important to provide maximum participation to the student community in sports, to keep the overall atmosphere of the institute healthy and sporting. Through this event students get all the opportunities to interact with each other and explore their hidden talent in sports. With this point of view and to encourage sports, the Physical Education Section celebrates the birth anniversary of the great Hockey legend Major Dhyanchand on 29th of August every year. This year following sports were organized under Annual Intramural program: Football, Cricket, Volleyball, Throw ball, Kho-Kho Table-Tennis, Kabaddi and Chess. This year's Krida Diwas was inaugurated by honorable Director of the institute, Dr. N. Chaudhary , all the students were distributed sweets on this occasion.

The objective of organizing such events in the campus is to involve the engineering students in some physical activities and teach them sportsmanship, team spirit and help them in socialization through sports activities. The Biggest advantage of organizing such event, especially for the first year B. Tech. students is that every student of the first year know each other. It also helps to provide solid platform for their healthy social relationship throughout their academic course; students also learn skills of organization, administration, officiating and coaching.

Medical examination:

Medical Examination is compulsory for all the first year B. Tech. /B. Arch. students in first semester itself. This examination is done by our Medical Officer Dr. S. Batra. and his team with the coordination of Physical Education section. This particular examination provides the data of students with postural deformities, obesity, underweight, stress, hypertension and some other medical problems. Thus with readily available data such students are provided individualized suitable physical fitness program.

Physical Efficiency Test:

Physical Fitness is an ability to carry out the daily tasks of the job with vigor and alertness, without undue fatigue, with ample energy to engage in leisure time pursuits and to meet the above average physical stresses in emergency situations.

The Physical Efficiency of every first year B. Tech. / B. Arch. students is measured by applying suitable tests of Physical Fitness. Components such as abdominal strength, respiratory endurance, flexibility of hip joint & hamstring muscles and speed are measured. PET is an important tool through which a student can know about his/ her physical efficiency as they have to perform all the below mention tests

in one day itself. All the students they appreciate this unique physical activity as it helps them to know their capability to do strenuous job tasks.

Module of Physical Efficiency Test:

Sr. No.	Component	Tests	Time/Distance	Score
1	Respiratory Endurance	Cooper's Test	12 minute	Total distance covered during 12 minute is recorded with the help of stop watch, and VO2 Max is calculated by applying suitable formula
2	Speed	100 meter flat race for boys/ 60 meter flat race for girls	100 meter/ 60 meter	Timing 100Mt/ 60 Mt. is recorded in seconds for each student
3	Abdominal Strength	Bent Knee Sit Ups	One Minute	Maximum legal sit ups performed in one minute is recorded for each student
4	Shoulder Strength	Push Ups/Modified push ups for girls	----------	Maximum push ups performed by is recorded for each student
5	Flexibility of Hp Joint and Hamstring Muscles	Sit And Reach	Centimetre	Maximum stretching is recorded in centimetre with the help of measuring scale for each student

NBA Visit:

The members of NBA team visited physical education section on 5th of January 2015 and inspected various facilities being provided by to the students. The team members were informed about various physical education program offered to the students.

Wellness and Weight Management program:

Overweight and obesity in the youth is on increase. It is the result of physical inactivity, and cause for poor physical fitness. It also carries high risk of developing chronic diseases like diabetes, blood pressure, heart trouble, joint problems etc. in the peak of their career.

On the basis of students identified through Medical Examination having postural deformities, overweight and underweight; a week long integrated program during second week of January 2015 by the team of Physician, Physiotherapist, Dietician, Counseller along with faculties of Physical Education was conducted for such students at Cricket pavilion.

Run for Unity:

Hundreds of students along with large number of staff members of the institute solemnly pledged on the occasion of Rashtriya Ekta Diwas on October 31 to dedicate themselves to preserve the Unity, Integrity and Security of the nation. Later

we all joined the “Run for Unity” programme organized by Physical Education Section at the institute campus. The program was inaugurated by the Registrar of the institute.

Swachata Bharat Abhiyan:

"Swachhta Shapath/Cleanliness Oath" was administered by faculties of physical education along with the student council members at 9.45 AM on 2nd October 2014.

Fitness talk in Hindi Workshop:

A fitness talk was organized by Dr. Robin Simon a faculty in Physical Education for the teaching and non teaching staff of the institute as one of the programme of Hindi Workshop. Different dimensions of physical fitness, various training principles, and effects of physical activities on different physiological systems were discussed in the workshop. Later various health related physiological parameters such as BMI, Rate of Respiration, Resting Pulse Rate, Visceral Fat, BMR, Flexibility etc. were tested. Appropriate physical fitness programme was also suggested according to individual’s need.

Sports facilities available on the Campus :

One Cricket Ground with six Turf wickets.
One Football Ground with flood light arrangement.
Two Volleyball Courts with flood light arrangement
Three Lawn Tennis Courts.
One Flood light Basketball Court.
One Kho- Ko ground with flood light arrangement
One Kabaddi ground with flood light arrangement
Well equipped Gymnasium
Separate Gym for girls in the girl’s hostel
Table Tennis Hall
Cricket pavilion with the seating capacity of 500 students
Indoor Badminton Stadium with four Wooden sprung Surfaced Badminton courts
A big hall to accommodate at least 12 Table Tennis Tables
A hall to practice Yoga Class room

****

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 is improvements in **percentage** during three successive years, assessment can be calculated as

Assessment = (b - a) + (c – b) + (a + b + c) 5/3

9.1. Improvement in Success Index of Students (5)

From 4. 1

Items	LYG	LYGm1	LYGm2	Assessment
Success Index	**0.74**	**0.72**	**0.84**	**3.93**

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

From 4. 2

Items	LYG	LYGm1	LYGm2	Assessment
API	**0.773**	**0.744**	**0.76**	**3.78**

9.3. Improvement in Student - Teacher Ratio (5)

From 5. 1

Items	CAY	CAY m1	CAY m2	Assessment
STR	**1.64**	**1.6**	**1.46**	**7.65**

9.4. Enhancement of Faculty Qualification Index (5)

From 5.3

Items	LYG	LYGm1	LYGm2	Assessment
FQI	**0.87**	**0.77**	**0.87**	**4.1**

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

From 5.7and 5.9

Items	LYG	LYGm1	LYGm2	Assessment
FRC	**1.4**	**1.44**	**1.28**	**6.74**
FPPC	**0.5**	**0.5**	**0.4**	**2.2**

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.**
1. Electrical Power Quality and its related issues	---	Electrical Engg. Dept. 9-11 Jan. 2014	3 days	Dr. S. P. Das, IIT Kanpur Dr. K. Chatterji, IIT Mumbai Dr. B. E. Kushare, K.K.Wagh College of Engg, Nashik Mr. Manas Kundu, APQI Mumbai	Faculty members, Ph.D scholars, M.Tech students	To create awareness about upcoming research areas in the field of power quality
2. Condition Monitoring of Transformer		Electrical Engg. Dept. 6-8 March. 2014	3 days	Dr. Shivaji Chakravati, Jadavpur University. Dr. Ravindra Bhide, GE, Bangalore Dr. Ganesh Kumbhar, IIT, Roorkee, Mr. Paramatma Dubey, CGL, Mumbai	Faculty members, Ph.D scholars, M.Tech students	To create awareness about upcoming research areas in the field of condition monitoring
3. Fractional Order Calculus and its applications in Engineering		Electrical Engg. Dept. 4-5 April 2013	2 days	Prof. Amitva Gupta, Jadavpur University Prof. S. Sen, IIT, Kharagpur Mr. Shantanu Das, BARC, Mumbai	Faculty members, Ph.D scholars, M.Tech students	To create awareness about upcoming research areas in the field of Fractional order calculus
4.LabVIEW Training Program		Electrical Engg. Dept. 31Aug. – 01 Sept. 2012	2 days	Kanchan Bhaku, Suraj Hinduja, Rohan Sood, NI, Bengaluru	Faculty members	To create awareness about LabVIEW
1. Application of Power Electronics to Power		Electrical Engg. Dept. 06-08 Feb. 2014	3 days	Prof. A. K. S. Bhat, Canada, Prof. Bhim Singh, IIT, Delhi Prof. M. K. Mishra, IIT, Madras	Faculty members, Ph.D scholars, M.Tech students	To create awareness about upcoming research areas in the field of Power

System				Prof. Shailendra Jain, MNNIT, Bhopal		Electronics
2. C2000 Microcontroller – Real Time MCU's		Electrical Engg. Dept. 17-18 Jan. 2014	2 days	Experts from TI	Faculty members, Ph.D scholars, M.Tech students	To create awareness about Microcontroller 2000
3. Introduction to Research Methodologies	IIT, Bombay	Electrical Engg. Dept. 25 June – 4th July. 2012	02 weeks	IIT B Faculties	Faculty members of various Engg. Colleges	To create awareness about various techniques in research activities
4. Free and open source softwares FOSS	IIT, Bombay	Electrical Engg. Dept. 09-11 Oct. 2012	3 days	IIT B Faculties	Faculty members, Ph.D scholars, M.Tech/B. Tech students	To create awareness about free and open software.
5. NM EICT Workshop	IIT, Kharagpur	Electrical Engg. Dept., VNIT, 02-12 Jan. 2014	10 days	IITK and IITB Faculties	Faculty members	To improve the teaching of Signal and Systems.

9.7. New Facility Created (15)

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

Facilities\POs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
Addition of Laboratory equipments in: Protection/Power Electronics/Drives Labs.	3	3	3	3	3	1	3	-	3	-	2
Augmentation of Software and hardware in existing computational Laboratory	3	3	1	3	3	-	1	-	-	-	2
Subscription of eBooks and journals	3	1	1	1	2	-	2	-	-	-	-
Multimedia infrastructure in class rooms	-	-	-	-	2	2	-	-	-	3	-

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

Specify the overall improvement:

Specify the strengths weakness	Improvement brought in	Contributed by	List the PO(s), which are strengthened	Comments, if any
CAY	Control Lab., PE Lab., Drives Lab., Switchgear and Protection Lab.	TEQIP-II FIST	a, b, c, d, e, f, g, h	
CAY*m*1	Hostel for MTech and PhD students	MHRD	--------	Strength of MTech students increased 18 to 24
	Laboratory: **1. Power Electronics:** • Chopper and Inverter Trainee • Power Electronics Software (PSIM) 9.3 • 3-Phase Cascaded 5 level H-Bridge Inverter • Double Inverter power module with controller and load • 3-phase Matrix Converter • Hioki Power Quality Analyzer • SRM Driver with motor • 3-phase Inverter with Induction motor • BLDC Drive with motor • 1 HP Five phase AC motor drive • FPGA Controller (NB 3000) **2. Protection:** • Synchro-phasor based relays for research in wide area protection of power system have added under FIST project **3. Drives:** • Multiphase Drives • Power Analyzer • BLDC Motor and their drives • SRM Motor and their drives **4. Renewable Energy:** • PV emulator, • Standalone PV system, and • Grid tied PV systems have added under TEQIP. **5. Control System:** • Inverted Pendulum • Magnetic Leviation	TEQIP FIST	a, b, c, d, e, f, g, h k	
CAY*m*2	• NIT Statutes	MHRD	f	
	• Two Faculties earned PhD degrees	Dr. V. S. Kale Dr. N. R. Patne	g	

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 (____) and the current financial year (_____) 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:
Date:

Annexure I

Placement details of students: 2013-14 are as follows:

Sr. No.	Name of the Student	Selected in Normal Company	Selected in Dream Company
1.	Arathi P.	HUL	
2.	Suraj Prakash Verma	Coal India	
3.	Raman Pratap Singh	Coal India	ABB-PPO
4.	Avijit Bansal	ZS	
5.	Neeraj Gaurav	Coal India	
6.	Namgail Lamo	Coal India	
7.	Kshitij Kumar	Finisar	
8.	Parag Vasvani	ZS	
9.	Rajesh Sonwane	Coal India	
10.	Prathamesh Kadam	Diebold	
11.	Vaibhav Kumar Uraon	Coal India	
12.	Uma Mahesh	Coal India	
13.	Akanksha Gupta	Pepsico	
14.	Ronit Khopkar	Futures First	
15.	Pranav Kurrey	Coal India	
16.	Swapnil Nikose	Coal India	

Placement details of students 2012-13 are as follows:

Sr. No.	Name of the Student	Selected in Normal Company	Selected in Dream Company
1.	Ravi Kumar	Neosym	BPCL
2.	Ajay Jamodkar		Oracle
3.	Bachu Ramesh	Va Tech Wabag	RINL Vizag
4.	N Murali Krishna	Accenture	HPCL
5.	Mamidi Swapnil Reddy	JSW	RINL Vizag
6.	S.Ritika	General Motors	
7.	V Guru Saran		OFSS
8.	Sai Saketh Divvela	Black & Veatch	
9.	Joginder Yadav	Tata Power	
10.	Kaustubh M Umathe	TCS	
11.	Ashwini Chavan	L&T Powai	
12.	Tanuj Kumar Mukherjee		Pepsico
13.	Anil Kumar		Finisar Malaysia
14.	Sadhana Bisen	Tata Power	
15.	Ghike Paresh	L&T Powai	
16.	Saurabh Satija	ABB	
17.	Shruti Bangar		ZS Associates
18.	T Shree Harhsa	JSW	RINL Vizag
19.	T Shiva Sai Gupta	Cargill	
20.	Pranoti R. Raut	L&T Powai	
21.	Amol Kelkar		ZS Associates

22.	V.V.S Anusha		Pepsico
23.	Kanchi Gupta		Delloitte
24.	Chandra Prakash Patel	Zuari	
25.	Kushal Gupta		ZS Associates
26.	K Hari Teja	ABB	
27.	Anubhav Meena		HPCL
28.	Javvaji Krishna Teja	IBMGBS	
29.	Kesavarapu.Anil Kumar	Neosym	
30.	P Avinash Babu	IBMGBS	
31.	Devraj Regmi	L&T Powai	
32.	Mayank Agarwal		Oracle
33.	Prathamesh Kesarkar	RIL	
34.	Chitvan Killawala	FCS	
35.	Mohammed Faraazuddin		Delloitte
36.	Atharva Purohit		Delloitte
37.	Monish M Mhatre		Delloitte
38.	Gaurav Deshpande		Oracle
39.	Soma Sudarshan Reddy	Lafarge	
40.	Ankur Agarwal		OFSS
41.	Mandar Hiwarkhedkar	Atos	
42.	G Sajjan	Accenture	
43.	Naman A Bang	Lafarge	
44.	Jayesh Sunil Gajre		Delloitte
45.	Mwkthangkwr Brahma		BPCL
46.	Ajit Tiwari		Delloitte
47.	Arpit Shah		Delloitte
48.	Sahil Lopes	L&T Powai	
49.	Pankaj Sangekar	Accenture	
50.	Kaliki Vivek		Delloitte
51.	Deepak Yadav	Emerson	
52.	Bvs Sai Krishna	Lafarge	
53.	N.Nikhitha	Atos	
54.	Dinesh Shevale	Accenture	
55.	Lade Vivek S	L&T Powai	
56.	Renu Verma	Praxair	BPCL
57.	Prashant Bighane	IBMGBS	BPCL
58.	Aditya Agarwal	Mu Sigma	
59.	Pallav Jauhari	IBMGBS	
60.	Vedant Bang		Delloitte
61.	D.Swathi Reddy	Atos	
62.	Keshav Somani	Geometric	
63.	Chandan Kumar Singh		Thoughtworks

Annexure II

FIRST SEMESTER
EEL101: ELECTRICAL ENGINEERING (3-0-0-6)

Objectives

- ***To teach basic ideas and principles of Electrical Engineering.***
- ***Understanding of details, electrical power system, transformer, generator, and motor.***

Contents

Electrical Circuit:- Circuit Elements Resistance, Inductance & Capacitance, Kirchhoff's Laws, Voltage Source (Definition, Characteristics of Practical Source, and Equivalent Current Source), and Star-Delta Transformation

Magnetic Circuit, Flux, MMF, Reluctance, Analogy with Electric Circuits. Simple Calculations for Composite Magnetic Circuits

AC Circuits :-Periodic Function, Average & R.M.S., Values, Steady State Behavior With Sinusoidal Excitation, Phasor Representation, Reactance & Impedance, Series & Parallel Circuit, Power Factor, Principle of Generation of Single Phase & Three Phase Voltages, Power in Balanced Three Phase AC System

Electrical Measurements:- Definition, Indicating, Integrating & Recording Instruments, Deflecting Controlling & Damping Mechanisms, Ammeter & Voltmeters, P.M.M.C. Type & Moving Iron Type, Electrodynamometer Type Wattmeters, Induction Type Single Phase Energy Meter

Transformers:- Introduction, Basic Principles, Construction, Phasor Diagram for Transformer under No Load Condition Transformer On Load, Balance of MMF on Sides, Phasor Diagram, Equivalent Circuit, Open Circuit & Short Circuit Test, Voltage Regulation and Efficiency

Power Systems: - Elementary Idea about Power Generation, Transmission and Distribution

Electric Machines:-

DC Shunt and Series Motor – Construction, Principle of Working, Characteristics, Speed Control and Applications

Induction Motors – Construction, Principle of Working of Single Phase and 3-Phase Motors. Torque Slip Characteristics

1. S.K. Bhattacharya, ' Basic Electrical and Electronics Engineering' , Pearson , 2012
2. O.I. Elgerd, ' Basic Electric Power Engineering', Addison Wesley Longman
3. Edward Hughes, ' Electrical Technology' , Longman

Reference Books:

1. Basic Electrical Engineering
   Web Course under NPTEL Authored by:- N. K. De, T.K. Bhattacharya and G.D. Roy
   Available: nptel.ac.in/courses.php#elec
2. 2. S.K. Bhattachary, ' Electrical Machines' , Tata McGraw Hill , 2006

Course Outcomes:
Students are able to

1. ***Understand basics of R , L , C circuit elements and voltage and current sources.***
2. ***Appreciate and analyse DC , AC and Magnetic circuits using KVL and KCL.***
3. ***Understand working principle of various analogue electrical measuring instruments.***
4. ***Comprehend the working of DC machines, Transformers and Induction Motors.***

POs / Course Outcomes	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Basics of R , L , C circuit elements	3	3	1	1	1	-	1	1	-	-	3
2. Analysis using KVL and KCL	3	3	3	3	-	-	-	-	1	-	3
3.Analogue electrical measuring instruments	3	2	-	-	1	-	-	-	-	-	2
4. Study of machines, Transformers	3	2	1	1	2	2	-	2	1	2	3

EEP101: ELECTRICAL ENGINEERING (0-0-2-2)
LIST OF EXPERIMENTS:

1) Study and verification of Kirchhoff's Laws applied to direct current circuit.
2) Determination of B/H curve of a magnetic material
3) Study of AC series circuits.
4) Study of AC Parallel circuits.
5) To study Balanced three phase circuit.
6) Determine Voltage regulation and efficiency of a single phase transformer by direct loading.
7) Speed control of a DC motor a) By varying field current with armature voltage kept constant
b) By varying armature voltage with field current kept constant.
8) Reversal of three phase induction motor.

THIRD SEMSESTER

EEL201: NETWORK THEORY (3-0-0-Credits -6)

Objectives:

- ***The subject deals with the various methods of analysis of electrical circuits under transient and steady state conditions.***

- ***It provides a solid foundation for later learning as well as for future professional activities.***

Syllabus:

Node and Mesh Analysis: Node and mesh equation, matrix approach of complicated network containing voltage and current sources, and reactances, source transformation, Graph Theory and network equations and duality.

Network theorem: Superposition, reciprocity, Thevenin's, Norton's, Maximum power Transfer, compensation and Tellegen's theorem as applied to AC circuits.

Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalance circuit and power calculation.

Laplace transforms and properties: Partial fraction, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

Transient behaviour, concept of complex frequency, Driving points and transfer functions poles and zeros of admittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and integral solutions.

Text Books:

1. Van Valkenburg, "Network Analysis", Third Edition, 2009, Prentice Hall of India.
2. Sudhakar, A. Shyammohan, "Circuits and Network", Third Edition, 2006,Tata McGraw Hill.

Reference Books:

Kelkar, Pandit, "Linear Network Theory", Pratibha Publication.

Course Outcomes:

Students are able to

1. ***Understand basics electrical circuits with nodal and mesh analysis.***
2. ***Appreciate electrical network theorems.***
3. ***Apply Laplace Transform for steady state and transient analysis.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Basics electrical circuits	3	3	3	3	1	1	-	-	-	-	3
2. Electrical network theorems-2	3	3	3	3	3	-	-	--	-	1	3
3. Apply Laplace Transform	3	3	3	3	3	1	-	-	-	-	2

EEP201: NETWORK THEORY LAB (0-0-2-2)

1. Study of 3 phase, Star connected, Unbalanced circuit.
2. Verification of Maximum Power Transfer Theorem
3. Verification of Superposition Theorem.
4. Verification of Reciprocity Theorem.
5. Determination of Two port parameters of given network.
6. Study of 3 phase, Delta connected, Unbalanced circuit.
7. Verification of Thevenin's and Norton's Theorem.
8. Study of Series and Parallel Resonance.

Note: The experiments are to be conducted for AC networks and excitation.

ECL206: ELECTRONIC DEVICES & CIRCUITS (3-0-0- Credits-6)

Objectives:

- ***To introduce students with the various concepts of electronic devices and circuits.***
- ***To teach the theory of various types of diodes, transistors, amplifiers, oscillators etc.***

Syllabus:

Semiconductor Physics, P &N Type Semiconductors, Diodes and Power Supplies, Theory of P-N Junction Diode, Junction Capacitance, Characteristics & Applications of Following Diodes, Zener, Schottkey, Photodiode, LED, LCD, Varactor Diode &Tunnel Diode

Power Supplies, Halfwave & Fullwave, Rectifiers, Filters, Ripple-Factor, Zener & Emitter Follower Type Regulators
Junction Transistors Theory of Operation, Static Characteristics , Break Down Voltages, Current Voltage Power Limitations, Biasing of BJT Different Biasing Arrangements, Stability Factor, Thermal Runaway, Power Transistors
Small Signal Analysis & High Frequency Analysis of BJT CE, CB, CC Amplifiers and Comparison High Frequency Analysis Calculation of Frequency Response, Gain Bandwidth Product

Power Amplifiers Classification A, B, AB, C Classes, Efficiency, Push Pull Configuration, Complimentary Symmetry, Second Harmonic & Cross Over Distortion. Positive and Negative Feedback Amplifiers Classification, Practical Circuits, Applications, Advantages. Oscillators Stability, Barkhausen Criteria, RC, LC & Crystal Oscillators

Field Effect Transistor & MOSFET, Principle of Operation & Characteristic, Biasing Arrangement, Small Signal Analysis of CG, CD & CS, High Frequency Analysis

Text Books:

1. Milman and Halkias, "Integrated Electronics", Second Edition, 2011, McGraw Hill.
2. Bapat, "Theory & Problem in Circuit analysis", McGraw Hill.

Reference Books:

1. Boylestad and Nashelsky, "Electronic Devices & Circuit theory",2011, Tenth Edition, Dorling Kindersley (RS).
2. Schilling & Belove, "Electronic Circuits - Discrete and Integrated", Third Edition, McGraw Hill.
3. Carr, "Electronic Devices", Tata McGraw Hill.
4. I.J. Nagrath, "Electronics - Analog and Digital", First Edition, 2009, PHI.

Course Outcomes:

Students are able to

1. ***Understand basics electronic circuits.***
2. ***Appreciate concepts of small signal analysis.***
3. ***Comprehend the operation of different power amplifier.***
4. ***Know high frequency analysis.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Basics electronic circuits											
2. Concepts of small signal analysis											
3. Different power amplifier											
4. High frequency analysis											

ECP206: ELECTRONIC DEVICES & CIRCUITS LAB (0-0-2- Credits-2)

List of Experiments:

1) To plot V-I Characteristics of diode and compare various parameters (both in forward and reverse bias)

2) To study zener diode as a voltage regulator & plot its load regulation characteristics.

3) To study full wave rectifier with & without filters and compare the ripple factor theoretically and practically.

4) To draw input/ output characteristics of common emitter configuration and compute the h-parameters.

5) To study JFET characteristics and compute various parameters.

6) To study and plot the frequency response of single stage BJT amplifier.

7) To study RC phase shift oscillator using BJT.

MAL201: INTEGRAL TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (3-0-0-Credits-6)

Objectives:

- ***To teach various mathematical transforms.***
- ***Study of partial differential equations.***

Syllabus:

Laplace Transforms: Definition of Laplace Transforms, Linearity Property, Condition For Existence of Laplace Transform, First and Second Shifting Properties, Transforms of Derivatives and Integrals, Evaluation of Integrals by Laplace Transform. Inverse Laplace Transform, Convolution Theorem, Laplace Transform of Periodic Functions, Unit Step Function and Dirac Delta Function. Applications of Laplace Transform to Solve Ordinary Differential Equations

Fourier series and Fourier Transforms: Fourier series, Half Range Sine and Cosine Series Expansions, Exponential Form of Fourier Series. Fourier Integral Theorem, Fourier Transform, Fourier Sine and Cosine Transforms, Linearity, Scaling, Frequency Shifting and Time Shifting Properties, Convolution Theorem

Z-Transform: Z - Transform, Properties of Z-Transforms, Convolution of Two Sequences, Inverse Z-Transform, Solution of Difference Equations

Partial Differential Equations: Formation of First and Second Order Equations, Solution of First Order Linear Equations: Lagrange's Equation, Particular Solution Passing through a Given Curve. Higher Order Equations with Constant Coefficients, Classification of Linear Second Order Poles, Method of Separation of Variables, Solution of one Dimensional Wave Equation, Heat Equation, Laplace Equation (Cartesian And Polar Forms), D'Alembert Solution of Wave Equation

Text Books:

1. Kreyszig, E. John, "Advanced Engineering Mathematics", Eighth Edition, 1999, Wiley & Sons.
2. R.K. Jain and S.R.K Iyengar, "Advanced Engineering Mathematics", Third Edition, 2007, Narosa Publishers.

Reference Books:

1. G.B. Thomas and R.L Finney, "Calculus and Analytic Geometry", Addison Wesley Longman Inc.

Course Outcomes:

Students are able to

1. ***Apply Laplace transform to solve differential equations.***
2. ***Understand theory and application of Fourier transform.***
3. ***Know basics of Z-Transform.***
4. ***Solve partial differential equations.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Solve differential equations											
2. Concepts of small signal analysis											
3. Different power amplifier											
4. High frequency analysis											

EEL204: MEASUREMENT AND INSTRUMENTATION (3-0-0- Credits-6)

Objectives:

- To study necessity and importance of Measurement and Instrumentation.
- To know about all kinds of electrical parameter measurements.
- To study sensors for measurement of electro-mechanical quantities etc.

Syllabus:

Introduction to Measurement and Instrumentation- Necessity, Errors in Measurement, Classification of Measuring Instruments, Comparison of Analog And Digital Instruments, Advantages of Digital Instruments, Classification of Analog Instruments, Absolute and Secondary Instruments, Indicating Type, Recording Type and Integrating Type Instruments, Extension of range by Shunts and Multipliers, Loading Effect of Instruments, Phase measurements, Q Meters

DC and AC Potentiometers- Principles and use of DC Potentiometer for Calibration Purposes, Principle and applications of AC Potentiometer

General Theory of Bridges- Resistance, Inductance and Capacitance Bridges and Their applications

Measurement of Power and Energy- Measurement of Active and Reactive Power in Poly Phase Circuits Using Dynamometer Type Instruments, Measurement of Energy in Single and Poly-Phase Circuits using Induction Type Instruments, Errors in Power and Energy Measurements, Maximum Demand Indicator, Tri-Vector Meter

Industrial Metering- General Theory of Extension of Range Using CT And PT, Errors in Instrument Transformers, Applications of Instrument Transformers and Connection of CT and PT to TV Meter, Concept of TOD and ABT Meters

Electrical Instrumentation- Classification of Transducers, Electrical Transducer for Motion Measurement, LVDT, RVDT, Piezoelectric Transducers, Variable Inductive and Variable Capacitive Transducers, Measurement of Shaft Torque and Power, Construction and Application of Megger.

Electronic Instrumentation- Introduction to Data Acquisition Systems, Methods for Analog to Digital Conversion, Errors in Analog to Digital Conversion, Application of Digital Voltmeters, Frequency Measurement, Integrated Circuits in Instrumentation: Timer (555), Function Generators (2206).

Text Books:

1. Sawhaney A.K., "A Course in Electrical and Electronics Measurements and Instrumentation", Eleventh Edition, Dhanpat Rai & Sons.
2. Golding E.W., Widdis F. C., "Electrical Measurements and Measuring Instruments", Wheeler's Student Edition, Fifth Edition,1999.

Reference Books:

1. Rangan, Sarma, "Instrumentation: Devices and Systems", Second Edition, 2009, Tata McGraw Hill Publication.
2. Doeblin, "Measurement Systems", Fifth Edition, Tata McGraw Hill Publication.
3. Cooper W.D., Helfrick A.D., "Electronic Measurements and Instrumentation", Third Edition, Prentice-Hall of India.

Gayakwad Ramakant, "OP-AMPS and Linear Integrated Circuits", Third Edition, Prentice-Hall of India Private Ltd.

Course Outcomes:

Students are able to

1. ***Understand basics electrical measurement circuits.***
2. ***Appreciate concepts of different transducers.***
3. ***Grasp the working of industrial metering.***
4. ***Know the operations of electronic instrumentation.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Electrical measurement circuits	3	3	2	2	3	2	3	3	2	2	2
2. Different transducers	2	3	2	2	2	2	3	1	2	2	2
3. Industrial metering	3	3	3	2	2	2	2	2	2	2	2
4. Electronic instrumentation	2	2	2	2	2	2	2	1	2	2	2

EEP204: MEASUREMENT AND INSTRUMENTATION LAB (0-0-2-2)
LIST OF EXPERIMENTS:

1) Measurement of low resistance by Kelvin double bridge.
2) Measurement of medium resistance by ammeter voltmeter method
3) To study polarity marking of current transformers.
4) Measurement of three phase power by two wattmeter method.
5) To study the characteristics of pressure cell with respect to signal conditioned output voltage.
6) To study and plot characteristics of LVDT.
7) To study the characteristics of developing torque and signal conditioned sensor output voltage.
8) Testing of poly phase energy meter by direct loading.

EEL206: ELEMENTS OF ELECTROMAGNETICS (3-0-0- Credits-6)

Objectives:

- ***To learn the fundamental concepts applied in Electrostatics, Magnetostatics, Time-varying fields and Electromagnetic Waves.***
- ***To apply the principles of Electromagnetic Field Theory for the design and analysis of Power Transmission lines.***

Syllabus:

Vector Algebra, Cartesian, Cylindrical and Spherical Co-ordinate System. Transformation of Variables from Cartesian to Cylindrical and Spherical Coordinate System and Vice-Versa

Coulomb's Law, Electric Field Intensity, Field of 'N' Point Charges, Field of Line and Sheet of Charge, Electric Flux Density, Gauss's Law and Its Applications, Divergence and Divergence Theorem

Definition of Potential Difference and Potential, Potential of Point Charge and System of Charges Potential Gradient, Energy Density in Electrostatic Field. Poisson's and Laplace's Equations, Current and Current Density, Continuity of Current Capacitance

Biot-Savart, Amperes Circuital Laws and their Applications, Curl, Stoke'sTheorem, Magnetic Flux Density, Scalar and Vector Magnetic Potential, Maxwell's Equations in Steady Electric and Magnetic Fields

Force on Moving Charge and Differential Current Element, Force and Torque on a Closed Circuit. Time Varying Fields and Maxwell's Equations

Uniform Plane Waves, Wave Motion in Free Space, Perfect Dielectric, Lossy Dielectric and Good Conductor, Skin Effect, Poynting Vector and Power Considerations. Reflection of Uniform Plane Waves, Standing Ratio

Text Books:

1.Hayt W.H., "Engineering Electromagnetics", 2013, Eighth Edition, Tata Mc-GrawHill.

2.Mathew, N.O. Sadiku, "Elements of Electromagnetics", International fifth Edition, Oxford University Press 2010.

Reference Books:

1. N. Narayan Rao, "Elements of Engineering Electromagnetics", Sixth Edition,2006, Pearson Education.

Course Outcomes:

Students are able to

1. ***Understand basics of electrostatic circuits.***
2. ***Grasp concepts of magnetostatics.***
3. ***Comprehend knowledge of time varying fields.***
4. ***Appreciate basics of electromagnetic waves.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modem Tools	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Understand basics of electrostatic circuits	3	3	1	2	1	1	1	-	1	1	3
2. Grasp concepts of magnetostatics.	3	3	1	2	1	1	1	-	1	-	3
3. Comprehend knowledge of time varying fields.	3	3	1	2	1	1	1	-	1	3	3
4. Appreciate basics of electromagnetic waves.	3	2	1	2	1	1	1	2	1	2	3

EEL210: ELECTRICAL SCIENCES (3-0-0-6)

Objectives

- ***To teach basics of electrical engineering by various methods of network analysis, measuring instruments, electrical machines etc.***
- ***Study of various electronic instruments.***

Contents

Nodal Analysis, Mesh Analysis, Source Transformation, Duality

Theorems: Superposition Theorem, Reciprocity Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem

Two Port Network: Two Port Network Parameters, Their Inter-Relation, Interconnection of Two Port Networks

Measurement of Low, Medium and High Resistances, Elementary Methods of Measurement of Inductance and Capacitance, Generalized Theory of Ac Bridges, Their Uses for Measurement of Inductance and Capacitance

Measuring Instruments: Classification, Absolute and Secondary Instruments

Electronic Instruments: Digital Voltmeters, Digital Multimeters, Cathode Ray Oscilloscope, Synchroscope Etc.

Generalized Principle of Operation of Alternators, Armature Reaction, Principle of Operation of Synchronous Motors, Starting Methods, Stepper Motor

Text/ Reference Books

1. Sawhney A. K. A course in electrical and electronics measurements and instrumentation, Dhanpat Rai and Sons, 11th edition
2. Van Valkenburg, Network Analysis, Prentice Hall of India Pvt. Ltd., 3rd edition
3. Kelkar, Pandit, Network Analysis, Pratibha Publications
4. B.L. Theraja , A.K. Theraja, A textbook of Electrical Technology (vol-II), S. Chand and company

Course Outcomes:

Students are able to

1. ***Know basics of nodal and mesh analysis.***
2. ***Appreciate different network theorems.***
3. ***Understand working of basic electrical and electronic instruments.***
4. ***Grasp the operation of basic electrical machines.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Nodal and mesh analysis.	3	3	1	1	1	-	1	1	-	-	3
2. Network theorems	3	3	3	3	-	-	-	-	1	-	3
3. Electrical and electronic instruments	3	2	-	-	1	-	-	-	-	-	2
4. Basic electrical machines	3	2	1	1	2	2	-	2	1	2	3

FOURTH SEMESTER

EEL202: SIGNALS AND SYSTEMS (3-0-0-Credits -6)

Objectives:

- ***The subject deals with various methods of analysis for continuous time and discrete time systems in time domain and frequency domain.***
- ***Being a basic course, students need to master this subject well and associate its basic concepts in order to become competent engineers.***

Syllabus:

Elements of Signal Space Theory: Different Types of Signals, Linearity, Time Invariance and Causality, Impulse Sequence, Impulse Functions and Other Singularity Functions.

Convolution: Convolution Sum, Convolution Integral and Their Evaluation, Time Domain Representation and Analysis, of LTI Systems Based on Convolution and Differential Equations.

Multi Input-Output Discrete and Continuous Systems: State Model Representation, Solution of State, Equations, State Transition Matrix.

Transform Domain Considerations: Laplace Transforms and Z-Transforms, Application of Transforms to Discrete And Continuous Systems Analysis, Transfer Function, Block Diagram Representation, and DFT.

Fourier series And Fourier Transform: Sampling Theorem, Discrete Fourier Transform (DFT), Estimating Fourier Transform Using (DFT).

Text Books:

1. Oppenheim A.V., Willsky A.S. and Young I.T., “Signals and Systems”, Second Edition,1997,Prentice Hall.

2. Simon Haykin and Barry Van Veen, "Signals and Systems", Second Edition, Wiley International.

Reference Books:

1. R.F. Ziemer, W.H Tranter and J.D.R.Fannin,., "Signals and Systems - Continuous and Discrete", Forth Edition Prentice Hall.
2. M. J. Roberts, "Signals and Systems",2003, Tata McGraw-Hill.

Course Outcomes:

Students are able to

1. ***Know basics of signal space theory.***
2. ***Understand convolution sum of two signals.***
3. ***Appreciate the concepts of state space representation.***
4. ***Apply different transform for discrete and continuous analysis.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Signal space theory	3	3	2	3	1	1	1	1	1	3	3
2. Convolution sum of two signals	3	3	3	3	3	1	1	1	1	2	3
3. State space representation	3	3	3	3	3	1	1	1	1	2	3
4.Transforms for discrete and continuous analysis	3	2	3	2	3	1	1	1	1	1	3

EEL203: ELECTRICAL MACHINES-I (3-0-0- Credits-6)

Objectives:

- ***To learn the basic operation and control of DC machines.***
- ***To learn transformer operation w.r.t. harmonics and connections.***
- ***To study the Induction motor***

Syllabus:

Winding: Types of Windings of DC and AC Machine, MMF of winding and induced EMF.

D.C. Motor: Basic Principle and Operation, Classification, Armature Reaction and Commutation, Inter-pole and Compensating winding, Torque, Characteristics, Starting, Speed Control, Braking, Permanent Magnet Machines, Losses, Efficiency, Testing, Applications.

Three Phase Transformer: Connection and Phasor Groups, Effect of Polarity Marking and Phase Sequence, Parallel Operation, Excitation Phenomenon and harmonics, Tertiary Winding, Unbalanced Operation, Single Phasing, Open Delta Connection, Testing of Transformer Bank for Proper Connection, Scott Connection, Tap Changing Transformer, Cooling of Transformer, Applications.

Three Phase Induction Motor: Principle and Operation, Classification, Torque Speed Characteristics.

Single Phase Induction Motor: Principle and Operation, Types, Equivalent Circuit, Characteristics, Applications.

Text Books:

1. P. S. Bhimbra, "Electrical Machinery", Seventh Edition, 1995,Khanna Publishers.

2. I. J. Nagrath, , D. P.Kothari, "Electric Machines", Third Edition, Tata McGraw-Hill Publishing Company Ltd.

3. A. E.Fitzgerald, Charles Kingsley, Jr. Stephen D. Umans, "Electric Machinery", Fifth Edition, Tata McGraw-Hill.

Reference Books:

1. P. S. Bhimbra, "Generalized Theory in Electrical Machines", Khanna Publishers.
2. P. K. Mukharjee, S Chakravarti, "Electric Machines", Dhanpat Rai & Sons.

Course Outcomes:

Students are able to

1. ***Know the basics of winding in electrical machines.***
2. ***Understand the working of DC machines***
3. ***Comprehend the operation and performance of three phase transformer.***
4. ***Appreciate the operational principle of three phase and single phase induction motor.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Winding in electrical machines	3	3	3	2	2	-	-	-	1	1	3
2. Working of DC machines	3	3	3	2	2	-	-	-	1	1	3
3. Three phase transformer	3	3	3	3	3	-	-	-	1	2	3
4. Induction motor	3	1	1	1	1	-	-	-	1	2	3

EEP203: ELECTRICAL MACHINES-I LAB (0-0-2-Credits -2)

List of experiments:

1. To study the speed control of DC Shunt Motor by a)varying armature voltage with field current kept constant, b)varying field current with armature voltage kept constant.
2. To perform Load Test on DC Shunt Generator.
3. To perform O. C. and S. C. Test on a Single Phase Transformer
4. To study the **a)** Polarity Markings on Single Phase Transformer Windings and to study **b)** Autotransformer.
5. To study the Load Test on a D C Cumulatively Compounded Motor.
6. To study the Load Test on a 3-Phase Induction Motor.
7. To determine Voltage Regulation and Efficiency of a Single Phase Transformer by Direct Loading.
8. To Study Scott-Connection of Transformers (Three Phase to Two Phase Conversion).

Reference Book:

D. P. Kothari, B. S. Umre, "Laboratory Manual for Electrical Machines", IK International New Delhi.

ECL207: DIGITAL CIRCUITS (3-0-0-Credits -6)

Objectives:

- ***Study of various number systems and logic gates.***
- ***Study of flip-flops, counters, encoders, decoders, multiplexers etc.***

Syllabus:

Analog Vs. Digital Systems, Transistor as a Switch, Boolean Identities, Logic Problems, Binary, Gray, Octal, Hex and ASCII Codes, Gates And Their Truth Tables, De Morgans Law, Sum of Products And Product of Sums.

Combinational Basic Concepts, SSI, MSI, VLSI Circuit Classification, Standard TTL, CMOS Characteristics, Decoders, Encoders, Multiplexers, Code Converters Characteristics of Display Devices, Standard Configuration of Gates As SSI/MSI/LSI Circuits, Arithmetic Circuits-Adders, Subtractors (Half And Full) BCD Adder/Subtractor, Concept of ALU.

Karnaugh Map, Simplification of Sum of Products and Product of Sums, Solution to Problems Using MUX as A Function Generator, Simplification of Logical Functions Using Quine-Mclausky Method.

Introduction To Flip-Flop, Latches, Concept of Clock, Memoir Organization With Flip-Flop as Basic Cell, RAM, ROM, EPROM, EEPROM, An Overview, Master Slave Combination and Conversion of One Type To Another Type Flip-Flops, Multi-Vibrators and Their Design Parameters.

Execution Tables and Introduction to Sequential Circuits, Counters, Synchronous / Asynchronous, Different Module Counters with Reset/Clear Facility, Design of Counters of Arbitrary Module with K-Maps, Lock Free Counters

Introduction to Sequential System, Design of Sequential System Using Moore and Miley System, Fundamental Mode Sequential Circuits.

Text Books:

1. H.Taub, “Digital Integrated Electronics”, First Edition,2008, McGraw Hill.
2. A. Anand Kumar, “Fundamentals of Digital Circuits”, Second Edition,2009, PHI.

Reference Books:

1. R.P.Jain,“Digital Logic Design”, First Edition, 2003, PHI.

2. Malvino, Leach, “Digital Principles and Applications”, Sixth Edition, 2006, McGraw Hill.

Course Outcomes:
Students are able to

1. ***Know the conversion of number system.***
2. ***Understand the concept of combinational circuits.***
3. ***Comprehend the basic of sequential circuits.***
4. ***Design counters.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problen	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Conversion of number system											
2. Concept of combinational circuits											
3. Basic of sequential circuits											
4. Design counters											

ECP207: DIGITAL CIRCUITS LAB (0-0-2- Credits-2)

List of experiments:

1) Study of logic gates.
2) Implementation of basic gates using universal gates.
3) Implementation of formula F=∑(0,1,4,5,6,8,9,12,13,14) using NAND gate only.
4) To study the half adder and full adder.
5) To study the MUX and DEMUX.
6) To study the encoder and decoder.
7) To study of JK, D, T flip flops.
8) Study of counters.
9) Study of shift registers.

EEL208: MATLAB PROGRAMMING (2-0-0-Credits-4)

Objectives:

- ***To learn MATLAB as a language for technical computing which integrates computation, visualization and programming.***
- ***To introduce some of the toolboxes like Symbolic Math and Signal Processing.***
- ***To introduce Simulink.***

Syllabus:

1. Introduction To MATLAB : Command Line Versus Programming
2. MATLAB Variables , Arithmetic Operations , Logical And Relational Operations, Mathematical Functions, Graphical Functions, Input-Output Operations , Elementary Matrix Manipulations
3. String Handling in MATLAB
4. Structures And Cell Arrays

5. MATLAB Language Constructs
    - If, Else, Else-If, For, While , Switch , Eval , Feval Etc.
6. MATLAB Scripts And User Created MATLAB Functions
7. In-Line Functions And Anonymous Functions
8. File Handling in MATLAB
9. 2-D And 3-D Plotting in MATLAB 14
10. Introduction To Concept of Tool-Boxes and Block-Sets in MATLAB
11. Advanced Features
    - Object Oriented Concepts In MATLAB
    - Introduction to Simulink
    - Communicating with Simulink Through MATLAB Script
    - Graphical User Interface

Text Books:

1. Rudra Pratap, "Getting Started with MATLAB 7", Oxford University Press (Indian Edition) 2006.
2. O. Beucher and M. Weeks, "Introduction to MATLAB and Simulink: A Project Approach", Second Edition, 2007, Jones & Bartlett Publishers.

Reference Books:

1. S.J.Chapman, "MATLAB Programming for Engineers", Third Edition, Thomson Learning.
2. R.K.Bansal, A.K.Goel, M.K.Sharma, "MATLAB and its Applications in Engineering", 2009, Pearson Education.

Course Outcomes:

Students are able to

1. ***Appreciate philosophy of MATLAB programming***
2. ***Develop problem solving skills using MATLAB.***
3. ***Comprehend various data and programming structures.***
4. ***Know file handling using MATLAB.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Philosophy of MATLAB programming	3	2	3	2	2	-	-	-	1	2	3
2. Solving skills using MATLAB	3	3	3	2	2	-	-	-	1	2	3
3. Data and programming structures	3	2	3	2	3	-	-	-	2	2	3
4. File handling using MATLAB	3	3	2	3	3	1	1	1	3	2	3

EEP208: MATLAB PROGRAMMING LAB (0-0-2-Credits-2)

1) Write a program to plot frequency response of LP/HP filters.
2) Write a program for study of maximum power transfer theorem.
3) Write iterative and recursive functions to generate Fibonacci sequence/to find factorial of a number etc.
4) Write a program to plot the transient response of the given RC and RL circuits using analytical solution.
5) Write a program to plot the transient response of the given RC and RL circuits using function in symbolic math tool box.
6) Write a program to compute standard deviation and RMS values of the signal using file I/O.
7) Write a program to extract the fundamental component of a signal using full cycle window DFT.
8) Write program to implement sorting methods: exchange sort, insertion sort, selection sort.
9) Write program to implement searching methods: sequential search, binary search.
10) Write a program to create student database using array of structures and perform functions such as searching and sorting.
11) Write a program to create a bank customer database using cell and perform functions such as searching and sorting.
12) Design the GUI for impedance calculator for series/ parallel RLC circuit.
13) Create a model in simulink to simulate faults on simple transmission system.

PHL202: INTRODUCTION TO MATERIAL SCIENCE (3-0-0-6)

Objectives

- ***To learn in depth about electrical and magnetic properties of materials.***
- ***To study properties of dielectric and semiconductor materials.***

Contents

Electrical Conduction : Electronic and Ionic Conduction , Conductivity in Metals , Ohm's Law , Relaxation Time , Collision Time , Mean Free Path of an Electron , Electron Scattering , Resistivity of Metals , Effect of Temperature and Impurity on Conductivity , Joule's Law , High Conductivity And Resistivity Materials , Superconductivity and Applications

Polarization of Dielectrics : Polar and Non-Polar Dielectrics , Basic Concept of Polarization , Types of Polarization, Dielectric Constant ,Internal Field in Dielectrics , Ferroelectric ,Spontaneous Polarization, Curie-Weiss Law, Piezoelectric And Pyroelectric , Dielectric Loss , Breakdown in Dielectrics, Dielectric in Alternating Field : Dielectric Properties of Insulators in Alternating Fields, Complex Dielectric Constant , Electronic Polarization , Ionic Polarization , Frequency Dependence of Electronic Polarization, Dielectric Constant of Non-Polar Solids , Dipolar Relaxation , Loss Tangent

Magnetic Properties of Materials: Atomic Interpretation of Diamagnetic, Paramagnetic, Anti-Ferromagnetic and Ferromagnetic Materials. Ferromagnetic Domain , Alloy for Core Materials for Rotating Machines , Transformers , Permanent Magnets and Non Magnetic Steels , Nonmetallic Magnetic Materials , Thin Film Magnets , Magnetic Materials for Ferromagnetic Tape And Memory Devices

Semiconductor Material Technology: Method for Material Preparation, Purification and Doping, Introduction to Processes of Manufacturing Semiconductor Devices, Transistors, Integrated Circuits .Monolithic Diodes, Integrated Resistors and Integrated Capacitor

Text/ Reference Books

1. Dekkar, A.J., Electrical Engineering Materials, Prentice Hall Publications Co.
2. Kasap S.O., Principle of Electronic Materials and Devices, Tata McGraw- Hill, 2nd Edition
3. Choudhary, D.Roy, Jain, Shail, Linear Integrated Circuits, New Age International
3. Pillai, S.O., Solid State Physics, New Age International Publishers, 3rd edition

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Course Outcomes:

Students are able to

1. ***Grasp the basics of electrical properties of material.***
2. ***Understand the concepts of magnetic properties of material.***
3. ***Know about semiconductor material technology.***
4. ***Appreciate the concepts of dielectrics.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Electrical properties of material											
2. Magnetic properties of material											
3. Semiconductor material technology											
4. Concepts of dielectrics											

MAL205: NUMERICAL METHODS & PROBABILITY (3-0-0-Credits-6)

Objectives:

- ***Study of various numerical methods.***
- ***Study of probability theory.***

Syllabus:

Numerical Analysis:

Solutions of Algebraic and Transcendental Equations by Iteration Method, Method of False Position, Newton-Raphson Method and Their Convergence, Solutions of System of Linear Equations by Gauss Elimination Method, Gauss Seidal Method, LU Decomposition Method Newton-Raphson Method for System of Nonlinear Equations, Eigen Values and Eigen Vectors: Power and Jacobi Methods.

Numerical Solution of Ordinary Differential Equations:

Taylor's Series Method, Euler's Modified Method, Runge-Kutta Method, Adam's Bashforth And Adam's Moulton, Milne's Predictor Corrector Method. Boundary Value Problems: Shooting Method, Finite Difference Methods.

Probability Theory:

Random Variables, Discrete and Continuous Random Variable, Probability Density Function; Probability Distribution Function for Discrete and Continuous Random Variable Joint Distributions

Definition of Mathematical Expectation, Functions of Random Variables, The Variance and Standard Deviations, Moment Generating Function other Measures of Central Tendency and Dispersion, Skewness and Kurtosis.

Binomial, Geometric Distribution, Poisson Distribution, Relation between Binomial and Poisson's Distribution, Normal Distribution, Relation Between Binomial and Normal Distribution. Introduction to Stochastic Processes.

Text Books:

1. S. D. **Cante**and, **C.de Boor,** "Elementary Numerical Analysis-an algorithmic approach", Third Edition, 1981,McGraw-Hill.
2. Gerald and Wheatley Addison, "Applied Numerical Analysis", Seventh Edition,2003,Wesley.

Reference Books:

1. K.S. Trivedi, "Probability Statistics with Reliability, Queuing and Computer Science applications", Second Edition,2012 Prentice Hall of India.
3. M.R. Spiegel, "Theory and problems of Probability and statistics", Second Edition, 2008, McGraw Hill Book Company.

Course Outcomes:

Students are able to

1. ***Solve problems based on all types of numerical methods.***
2. ***Study and applications of probability theory.***
3. ***Understand basics of probability distribution function.***
4. ***Know stochastic processes.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex proble	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1 Numerical methods											
2. Probability theory											
3. Probability distribution function											
4. Ptochastic processes											

EEL215: ELECTRICAL POWER UTILIZATION (3-0-0-Credits-6)

Objectives:

- ***To enable the students to understand the concepts of electrical heating, welding, illumination, traction and their uses in industry.***

Syllabus:

Electrical Traction : Features of an Ideal Traction System, Systems of Electrical Traction, Mechanism of Train Movement, Speed- Time Curve, Traction Supply System, Transmission Line to Substation, Feeding and Distribution System on an AC Traction, System of Current Collection, Traction Motors, Tractive Effort and Horse Power, Speed Control Schemes, Electric Braking

Electric Heating: Classification, Heating Element, Losses in Oven and Efficiency, Resistance Furnace, Radiant Heating, Induction Heating, High Frequency Eddy Current Heating, Dielectric Heating, Arc Furnace, Heating of Furnace, Electric Welding, Methods and Equipments, Electrolysis and Electroplating Applications

Illumination: Radiant Energy, Terms and Definitions, Laws of Illumination, Polar Curves, Photometry, MSCP, Integrating Sphere, Luminous Efficacy, Electrical Lamps, Design of Interior and Exterior Lighting Systems, Illumination Levels for Various Purposes, Light Fittings, Factory Lighting, Flood Lighting, Street Lighting, Energy Conservation in Lighting

Air Conditioning and Refrigeration: Control of Temperature, Protection of Motors, Simple Heat-Load and Motor Calculations, Air Conditioning, Functioning of Complete Air Conditioning System, Type of Compressor Motor, Cool Storage, Estimation of Tonnage Capacity and Motor Power, Technology of Electric and Hybrid Electric Vehicles

Basics of Domestic Electrical Wiring, Types of Cables, Flexible Wires Sizes and Current Capacity, Use of Fuse, MCB and MCCB (Working and Construction), Idea about Megger, Basics of Air Flow for No Fans in a Room.

Text Books:

1. Taylor E. Openshaw, “Utilization of Electrical Energy”, 1968, Orient Longman.
2. Gupta J. B., “Utilization of Electric Power and Electric Traction”, 2002,S. K. Kataria and Sons
3. Wadhwa C.L., “Generation, Distribution and Utilization of Electrical Energy”,1993, Wiley Eastern Limited,
4. Garg and Girdhar, “Utilisation of Electric Energy” 1982, Khanna Publisher.
5. Pratab H., “Art and Science of Utilization of Electrical Energy”, Second Edition, Dhanpat Rai and Sons, New Delhi.

Reference Books:

1. S.C.Tripathy, “Electric Energy Utilization and Conservation”,1993, Tata McGraw Hill.

Course Outcomes:

Students are able to

1. ***Understand the working of traction system.***
2. ***Know the properties of different electric heating system.***
3. ***Grasp the detail idea of effective power utilization.***

4. Comprehend basic domestic electric wiring.

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Traction system	3	3	2	2	2	1	1	-	2	1	1
2. Different electric heating system	3	2	2	2	2	1	1	-	2	1	1
3. Effective power utilization	3	3	3	3	3	2	1	-	2	1	1
4. Domestic electric wiring	3	3	3	3	2	1	1	-	2	1	1

EEP207: ADVANCED PROGRAMMING LAB (0-0-2-2)

LIST OF EXPERIMENTS:

1) First step in graphics.
2) Drawing Resistor Symbol.
3) Lissajous Patterns.
4) Synthesis if Square Wave Using Fourier Series.
5) Manually creating a Linked list.
6) Creating a Linked List programmatically.
7) Relative Grading program
8) Deleting User Selected Node from Linked list.
9) Reversing a linked list (Not in Place).
10) Towers of Hanoi: Generating Moves for solving.
11) Study of Recursion.
12) Implementation of Stack Using Array.
13) Queue Implementation of Stack Using Array.
14) Passing a function using function pointer: Table of reciprocals
15) Passing a function using function pointer: Numerical integration.
16) To do list using linked list of CHAR pointers.
17) Online Quiz.
18) Discrete Fourier transform.
19) Interfacing Hardware through pointer port

FIFTH SEMESTER

EEL301: ELECTRICAL POWER SYSTEM-I (3-0-0- Credits -6)

Objectives:
Study of

- ***Basic power system and infrastructure.***
- ***Connection of generation, transmission, distribution and utilization in power system.***
- ***Grid system and power flow, per unit calculation.***

Syllabus:

General Structure of Electrical Power System- Introduction to Power System, Generation, Transmission, Distribution and Utilization- Overview Single Line Diagram (SLD) Representation

Transmission Substations- Different Types of Transmission Substations, Idea About Substation and Equipments in Substation, Radial and Grid Systems, Concept of instantaneous, Real, Reactive and Complex Power, Three Phase Power and Power Loss.

Transmission Lines- Types of Transmission Lines, Basic Concept of Inductance and Capacitance of Transmission Lines, Modes of Short, Medium, Long Transmission Lines, A, B, C, D Parameters, Transmission Line Voltage Control Methods

Per Unit System- Necessity, Advantages, Applications in Power Systems and Calculations

Load Flow Analysis- Y Bus Formation, Gauss Iterative and Gauss Seidal Method, Method for Solution of Load Flow Problem (Not More Than 3 Buses) MATLAB Program

Control Model- Load Frequency Control, Model of Turbine Speed Governing System, Load Sharing By Generators, Concept Of Control Area, Two Area Load Frequency Control, Model of Automatic Voltage Regulator (AVR), Voltage Behind Reactance Model of Generator and Power Angle Characteristics.

Text Books:

1. W.D. Jr. Stevenson, "Elements of power system analysis", Third Edition, McGraw Hill publications.
2. I. J. Nagrath, D. P.Kothari, "Power System Engineering", Third Edition , 2003,Tata – McGraw Hill publications.

Reference Books:

1. O. I. Elgerd, "Electric Energy Systems Theory", Revised Edition, 1983, McGraw Hill publications.
2. J.Grainger John, W.D. Jr. Stevenson, "Power System Analysis", International Edition, McGraw Hill.
3. 3. Sadat Hadi, "Power System Analysis", International Edition, McGraw Hill.

Course Outcomes:

Students are able to

1. ***Perform p.u. calculation in power system.***
2. ***Know basics of electrical power transmission system.***
3. ***Solve load flow problems.***
4. ***Understand concepts of different control model.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1 p.u. calculation	3	3	3	3	3	3	-	-	2	-	3
2. Basics of electrical power transmission system.	3	3	3	3	3	3	2	-	3	2	2
3. Load flow problems	3	3	3	2	3	3	2	-	3	2	2
4. Concepts of different control model	3	3	3	3	2	3	2	-	3	2	2

ECL321: MICROPROCESSORS & INTERFACING (3-0-0-6)

Objectives

- ***To learn architecture, assembly language of microprocessor.***
- ***Interfacing microprocessor with various devices.***

Contents

VSLI Circuit Concept, Approach to Integrated System Design Using Microprocessors. Bus Concepts Address Data and Control Organization of a Computer with MPU
Bits/Bytes/Words/Long Words – Their Ranges – Accuracy and Precision Memory Organization Linear/Absolute Decoding

Introduction to Intel's 8085A Architecture, Description, Software Instructions, Addressing Modes, Advantages, Timing Diagram Assess Assemblers and Dissemblers (By Hand Coding) Flag Structure, Concept of PSW Stacks and Subroutines, Simple and Nested PUSH, POP Instructions and CALL/RETURN Instruction Stack Manipulation Simple Programs, Counters and Timing Delays.
Interrupts – Concept And Structure In 8085 Interrupt Service Routines. Advanced Instructions &Programming of 8085 and Programming

Methods of Data Transfer- Serial, Parallel, Synchronous Asynchronous. IN/OUT Instructions Timing Diagrams Simple Hardware Interface to 8085 of Standard Latches/Buffers/Keys/Display Devices as I/O Ports Handshaking Concepts Architecture and Interface of 8255 And 8253 To 8085

Hardware Considerations – Bus Contention Slow Memory Interfacing Complete Signal Description of 8085 Multiplexed Key Board/Display Interface and Assembler Directives, General Awareness about Micro-Computer System Related Products..

Text/ Reference Books

1. Gaonkar R.S., Microprocessor architecture- Programming & Applications 8085, Penram International, 4th Edition.
2. Uffenbeck J., Microcomputers and Microprocessors, Prentice Hall of India, 3rd Edition.

Course Outcomes:

Students are able to

1. ***Write codes for microprocessor programming.***
2. ***Understand concepts of different interfacing techniques.***
3. ***Know operation of different microprocessors.***
4. ***Develop microprocessor based control schemes.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Codes for microprocessor programming											
2. Concepts of different interfacing techniques											
3. Operation of different microprocessors											
4. Microprocessor based control schemes											

EEL302: ELECTRICAL MACHINES-II (3-0-0- Credits -6)

Objectives:

- ***This subject imparts knowledge on construction, operation and applications of synchronous and induction motors.***

Syllabus:

Three Phase Induction Motor: Torque Slip Characteristics, Determination of Equivalent Circuit Parameters, Losses and Efficiency, Circle Diagram, Starting, Speed Control and Breaking, High Torque Motors (Double Cage Motor), Crawling and Cogging, Applications, Induction Generator.

Three Phase Synchronous Generator: Introductions, Constructional Features of Cylindrical and Salient Pole Rotor Machines, Steady State Operation of Three Phase Synchronous Generators: Phasor Diagram, Regulation. Steady State Performance of Three Phase Synchronous Generator

Synchronizing of Generator with another Generator: Parallel Operation, Reactances (Parameters) and their Measurement (Experimental Determination), Short Circuit Ratio, Losses and Efficiency

Synchronous Machines on Infinite Bus: Phasor Diagram, Expression for Torque, Load/Torque Angle, Synchronous Motor Operation, Effects of Variable Excitation and Power Input on Generator Operation and Effect of Variable Excitation and Load on Motor Operation.

Transient Behavior: Sudden 3-Phase Short Circuit, Time Constants and Equivalent Circuit Diagrams, Damper Windings.

Introduction To Special Machines: Repulsion Motors, AC Series Motors, Universal Motors, Reluctance Motor, Hysteresis Motor, Schrage Motor, Power Selsyns, Position Selsyns, (Only Elementary Aspects Of The Above Types Are Expected).

Text Books:

1. P.S. Bhimbra, "Electrical Machinery", Seventh Edition, 1995, Khanna Publishers.
2. P.S. Bhimbra, "Generalized Theory in Electrical Machines", Khanna Publishers.
3. I. J. Nagrath, D. P. Kothari, , "Electric Machines", Third Edition, Tata McGraw-Hill Publishing Company Ltd.

Reference Book:

1. A. E Fitzgerald, Charles Kingsley, Jr. Stephen D. Umans, "Electric Machinery", Tata McGraw-Hill, Fifth Edition.
2. P. K. Mukharjee, S. Chakravarti, "Electric Machines", Dhanpat Rai & Sons.

Course Outcomes:

Students are able to

1. ***Know characteristic and performance of induction machines.***
2. ***Grasp working of three phase synchronous machine and its applications.***
3. ***Understand operations of synchronous machines under short circuit conditions.***
4. ***Appreciate working of special electrical machines.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solution	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Performance of induction machines	3	3	2	2	1	3	2	1	1	3	3
2. Three phase synchronous machine	3	3	2	3	1	3	3	1	1	3	3
3. Short circuit condition- SM	3	3	1	3	3	1	1	1	1	3	3
4. Special electrical machines	3	1	1	1	1	2	2	1	1	2	3

EEP302: ELECTRICAL MACHINES-II LAB (0-0-2- Credits-2)

List of experiments:

1. To Study the Variation of Speed and Load Test on Schrage Motor.
2. To Plot *V* and Inverted *V (Λ)* Curves of a Synchronous Motor.
3. To determine the ratio X_q/X_d for Three Phase Alternator by using "Slip Test"
4. To Study the Synchronization of an Alternator with an Infinite Bus by "Dark Lamp Method"
5. To determine Potier Reactance of Three Phase Alternator by "Zero Power Factor Saturation Curve".

6. To determine Negative Sequence and Zero sequence Reactances of Synchronous Generator.
7. To Study the Characteristics of Three Phase Induction Generator.
8. To Determine Direct Axis Subtransient (X_d"), Quadrature Axis Subtransient (X_q") Synchronous Reactances of Synchronous Machine.

Reference Book:

1. D. P. Kothari, B. S. Umre, "Laboratory Manual for Electrical Machines", IK International New Delhi.

EEL305: CONTROL SYSTEM -I (3-0-0-Credits -6)

Objectives:

- ***Control system is a tool subject. The lessons in basics will help to use this tool in various main subjects like power system and power electronics.***
- ***The use of feedback to improve the system performance can be understood if this subject is studied.***

Syllabus:

Introduction to Need for Automation and Automatic Control Use of Feedback, Broad Spectrum of System Application

Mathematical Modeling, Diff. Equations, Transfer Functions, Block Diagram, Signal Flow Graphs, Application to Elementary System Implications, Effect of Feedback on Parameter Variation, Disturbance Signal Servomechanisms and Regulators.

Control System Components, Electrical, Electromechanical, And Other Components. Their Functional Analysis and Input Output Representation.

Time Response of Systems, First Order and Second Order System, (Standard Inputs) Concept of Gain and Time Constants Steady State Error, Type of Control System, Approximate Methods for Higher Order System

Root Location and its Effect on Time Response, Elementary Idea of Root Locus, Effect of Adding Pole and Zero and Proximity of Imaginary Axis.

Stability of Control Systems, Conditions of Stability Characteristic Equation, Routh Hurwitz Criterion, Special Cases for Determining Relative Stability.

Frequency Response Method of Analyzing Linear System, Nyquist and Bode Plots, Stability and Accuracy Analysis From Frequency Responses, Open Loop and Close Loop Frequency Response. Nyquist Criterion, Effect of Variation of Gain and Addition of Pole and Zero on Response Plot, Stability Margins in Frequency Response.

State Variable Method of Analysis, Characteristic of System State Choice of State Representation of Vector Matrix Different Equation Standard Form, Relation between Transfer Function and State Variable, Solution of the state equations (STM).

Text Books:

1. I. J. Nagrath & M. Gopal, "Control System Analysis", Fifth edition, 2010, New Age International.
2. M. Gopal, "Control Systems- Principle of Design", Fourth Edition, 2012, McGraw Hill.

Reference Books:

3. D'AzzoHoupis, Logakusha, Huelsoman, "Linear System Analysis", McGraw Hill.

4. B.C. Kuo, "Automatic Control Systems", Prentice Hall.
Norman Nise, "Control System Engineering", John Wiley & Sons Inc.

Course Outcomes:

Students are able to

1. ***Mathematical modeling and derivation of transfer function of various systems.***
2. ***Determination of the stability of system and the time domain analysis.***
3. ***Analysis of systems in frequency domain.***
4. ***State space modeling of system and its analysis .***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Modeling and derivation of transfer function	1	2	1	2	2	2	-	1	2	2	3
2. Stability of system and the time domain analysis	2	2	2	2	3	2	1	1	2	3	3
3. Analysis of systems in frequency domain	3	3	2	2	3	2	1	1	2	3	3
4. State space modeling of system	2	2	3	3	3	2	1	1	2	3	3

EEP305: CONTROL SYSTEM –I LAB (0-0-2-Credits-2)

List of experiments:

1. A) To Study the characteristics of Potentiometer as an error detector.
   B) To Study the characteristics of a i) Synchro transmitter
   ii) Synchro as an error detector
2) To Study transient response of second order R-L-C Circuit using discrete components.
3) To study the Torque-Speed characteristics of Two Phase A.C Servo motor .
4) To Study the effect of addition of pole to the second order closed loop control system by using MATLAB.
5) To Study the frequency response of a second order R-L-C series circuit using discrete components.
6) To Study the phase lead and phase lag networks Using discrete components.
7) A) To study the effect of addition of pole on frequency response of second order closed loop system by using MATLAB

B) To study the effect of Zero and pole to open loop transfer function of a second order system with unity feed back by using MATLAB.
8) To study the effect of PID controller using a Kit.

EEP306: ELECTRICAL ENGINEERING WORKSHOP LAB (0-0-2-Credits-2)

List of experiments:

1) To Study different Electrical symbols.
2) To Study Characteristics of fuse wire.
3) To design single phase 50hz 230/12 v, 50VA transformer
4) To Study power quality interference caused CFL
5) Study of switching transients in power system.
6) Study of phase shift of star delta transformer.
7) Study of impact of balanced non linear load on neutral current.
8) Industrial visit report.
9) Study different electrical switchgear in substation
10) Introduction to mini hardware & software project.
11) To study household wiring.
12) Hardware and software mini project.

EEL307: ELECTRICAL MACHINE DESIGN (3-0-0-6)

Objectives

- ***To teach the design principles of magnetic circuit and winding, three phase transformers and 3 phase induction motor.***
- ***Study of heating and cooling of machines.***

Contents

Review Of Material Used In Construction of Electrical Machines Classification of Insulating Materials Depending Upon Permissible Temperature Rise, Properties of Transformer Oil, Standard Specifications, C.M.R. and Short Time Rating of Machines. Heating and Cooling Characteristics

Transformer Design: Specific Loading, Equation for Voltage per Turn for Power and Distribution Transformer Output Equation

Principle of Electric and Magnetic Circuit, Design, Method of Cooling and Cooling Circuit Design Estimation of Performance Characteristics from the Design Data

Induction Motor: Main Dimensions, Output Equation, Loading Constants, Estimation of Axial Lengths, Air Gap Diameter, Winding Design. Air Gap Length, Slot Dimension for Stator and Rotor, Cage Rotor and Wound Rotor Design, Calculation of No Load Current and Other Performance on Characteristics for Design Data

Synchronous Machines: Air Gap Length, Methods of Obtaining Sinusoidal Output Voltage, Field Coil Design for Salient Pole Machine and For Turbo Generator Rotor. Ventilation of Synchronous Generator, Cooling Air Circuits, Closed Ventilation/Quantity of Cooling Medium Hydrogen and Water as Cooling Media

Text/ Reference Books

1. Say M.G., Performance and design of A.C. Machines
2. Sawhney A.K., Electrical Machine Design, Dhanpatrai and sons
3. Balbir Singh, Electrical Machine Design, Bright Student Publication
4. Vasutinksy S.B., Power Transformer, P.S.G. College of Technology
5. Deshpande H.V., Electrical Machine Design

Course Outcomes:

Students are able to

1. ***Know the philosophy of design of Electrical Machine.***
2. ***Design the transformer (Single and three phase).***
3. ***Design the three phase AC Machines.***
4. ***Find out the performance of Designed Machines.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Philosophy of design	3	3	3	2	2	1	1	1	1	-	1
2. Design of transformer	3	3	3	3	3	1	1	1	1	-	1
3.Design of three phase AC Machines	3	3	3	3	3	1	1	1	1	-	1
4. performance of Designed Machines	3	3	3	3	3	1	1	2	1	-	1

EEL405: POWER STATION PRACTICE (3-0-0-Credits-6)

Objectives:

- ***To learn the operations of various power plants.***

Syllabus:

Conventional Sources of Electrical Energy - Steam, Hydro, Nuclear, Diesel and Gas; Their Scope and Potentialities for Energy Conversion

Generation – Different Factors Connected With a Generating Station; Load Curve, Load Duration Curve, Energy Load Curve; Base Load and Peak Load Plants.

Thermal Stations – Selection of Site, Size and Number of Units, General Layout, Major Parts, Auxiliaries, Generation Costs Of Steam Stations.

Hydro Stations – Selection of Site, Mass Curve, Flow Duration Curve, Hydrograph, Classification of Hydro Plants, Types of Hydro Turbines, Pumped Storage Plants.

Nuclear Stations – Main Parts, Location, Principle of Nuclear Energy, Types of Nuclear Reactors, Reactor Control, Nuclear Waste Disposal.

Power Station Control and Interconnection – Excitation Systems, Excitation Control, Automatic Voltage Regulator Action; Advantage of Interconnection

Alternate Energy Sources Overview

Text Books:

1. M.V. Deshpande, "Elements of Electrical Power Station Design", 2010, PHI.
2. B.R. Gupta, "Generation of Electrical Energy", 2003, Eurasia Publishing house.
3. M.M. El-Wakil, "Power Plant Technology", 1985, McGraw- Hill.

Reference Books:

1. Arora and Domkundwar, "A Course in Power Plant Engineering", 1988, Dhanpat Rai and Sons.

Course Outcomes:

Students are able to

1. ***Know working of conventional sources of electrical energy.***
2. ***Understand behaviour of different generating stations.***
3. ***Comprehend operations of different conventional power stations.***
4. ***Appreciate detail study of power station control problem.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Know working of conventional sources of electrical energy.	3	3	3	2	1	3	2	-	3	2	3
2. Understand behavior of different generating stations.	3	3	3	2	1	2	2	-	3	2	2
3. Comprehend operations of different conventional power stations.	2	3	2	2	1	2	2	-	3	1	3
4. Appreciate detail study of power station control problem.	3	2	2	2	1	1	1	-	2	1	3

SIXTH SEMESTER
EEL303: POWER ELECTRONICS (3-0-0-Credits -6)

Objectives:

- ***To learn different power semiconductor devices.***
- ***To learn different converter topologies, their operation and applications.***

Syllabus:

SCR and its Characteristics, Gate Characteristics SCR Ratings, Series and Parallel Connections of SCRs, Uni-Junction Transistor Triggering Circuits and Opto-couplers, Commutating Circuits, Protection of SCR. Gate Circuit Protection. Over Voltage and Over Current Protection Snubber Circuit Design Converter Circuit Faults and their Protection.

Line Commutated Converters: Working of Single Pulse Converter. Two Pulse Converters Three Phase Six Pulse Bridge

Converters Effect of Source Inductance in Converters Effect of Free Wheeling Diode, Speed Control of DC Motor Using

Converter. AC Voltage Controllers, Cyclo-Converters (Single Phase)

Static Controllable Switches: Characteristics and Working of MOSFET. Gate Turn Off Thyristor and Insulated Gate Bipolar

Transistor.

D.C Choppers: Classification, Principles of Step Down Chopper Step Up Chopper, Impulse Commutated and Resonant

Chopper. Application of Choppers.

Single Phase and Three Phase Bridge Inverters: Output Voltage Control, Harmonics in Output Voltage Waveform,

Harmonics Attenuation by Filters, Harmonic Reduction by Pulse Width Modulation Techniques Analysis for Single
Pulse Width Modulation, Working of Current Source Inverters, few Applications of Inverters, Principle of Resonant Inverter

Text Books:

1. M. Rashid, "Power Electronics", Pearson Education India, 2004.
2. P.S. Bhimbra, "Power Electronics", 2012, Khanna Publisher.

Reference Books:

1. M.D. Singh, K.B. Khanchandani, "Power Electronics", Tata McGraw Hill.
2. Ned Mohan, "Power Electronics", Third Edition, 2012, John Willey.
3. C.Y. Lander., "Power Electronics", Third Edition, 1993, McGraw Hill International.
4. B.K .Bose, "Modern Power electronics", 2003, Pearson Education India.

Joseph Vithyathil, "Principles of Power Electronics", First Edition, 2010,Tata McGraw Hill.

Course Outcomes:

Students are able to

1. ***Know concepts of semiconductor switches.***
2. ***Understand operation and applications of different power electronic converters.***
3. ***Appreciate working of PWM techniques.***
4. ***Comprehend operation of inverter.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Concepts of semiconductor switches	3	2	3	2	2	1	1	-	-	1	3
2. operation and applications of different PE Converters	3	3	3	2	2	1	1	1	-	1	3
3. PWM techniques	2	2	2	2	3	1	1	1	-	1	3
4. Operation of inverter	2	2	2	2	3	1	1	-	-	1	3

EEP303: POWER ELECTRONICS LAB (0-0-2- Credits-2)

List of experiments:

1) To study the V-I characteristics of SCR.
2) To study DC circuit breaker using SCR.
3) To study phase control AC-DC converter using SCR.
4) To study the relaxation oscillator using UJT.
5) Simulation of i) Single phase half wave rectifier.
ii) Single phase full wave fully controlled rectifier [R, R-L, R & high L].
6) To study four modes of operation of TRIAC
7) To study AC Voltage regulator using SCR/TRIAC.
8) To study single phase inverter using self controlled devices as IGBT/MOSFET (single PWM,
Multiple PWM, Sinusoidal PWM)
9) To study the Three phase inverter.
10) To study DC-DC converter i) Buck converter ii) Boost converter.
11) Simulation of following experiments using PSIM
i) AC Voltage regulator using SCR, ii)Single phase inverter using self controlled devices as IGBT/MOSFET
(Single PWM, Multiple PWM, sinusoidal PWM) iii) Three phase inverter. iv) DC-DC converter **:** - a) Buck converter.
b) Boost converter.

EEL304: ELECTRIC DRIVES & THEIR CONTROL (3-0-0-6)

Objectives

- ***Understanding the operation of various drives.***
- ***Learning about PLC and control of motors.***

Contents

Definitions, Classification and Speed Torque Characteristics of Common Drive Motors and their Characteristics Under Starting, Running, Braking And Speed Control
Rating & Service Capacity: Selection of Motor, Power Capacity For Continuous And Intermittent Periodic Duties, Load Equalization: Flywheel Effect, Speed-Time Relations
Programmable Logic Controllers: Basic Construction, Operation Block Diagram Arrangement, Its Elementary Programming and Applications in Electric Drives

AC And DC Contactors And Relays: Magnetic Structure, Operation, Arc Interruption Contactor Rating, H.V. Contactors, Control Circuits For Automatic Starting And Braking Of DC Motor And Three Phase Induction Motor, Control Panel Design
Traction Motors: Motor Used In AC/DC Traction, Their Performance and Desirable Characteristics, Requirements and Suitability of Motor for Traction Duty. Control of D.C. Traction Motor, Series Parallel Control Starting and Braking Of Traction Motor
Brief Idea About Drives Commonly Used In Industries, Digital Control of Electric Motors, Block Diagram Arrangement, Comparison With Other Methods Of Control

Text/ Reference Books

1. Heumann G.W., Magnetic Control of Industrial Motors, John Wiley & Sons, Second Edition

2. Soni M.L., Gupta P.V, Bhatnagar U.S., A course in Electrical Power, Dhanpat Rai & Sons 1999
3. Partab H., Art & Science of Utilization of Electrical Energy, Dhanpat Rai & Sons, 1999
4. Partab H., Modern Electrical Traction, Pritam Surat & Brothers, 1973
5. Vedam Subrahamanyam, Electric Drives – Concepts & Applications, Tata McGraw-Hill 1997

Course Outcomes
Students are able to

1. ***Understand selection of drives for industries.***
2. ***Know operation of PLC, contactors and relays.***
3. ***Appreciate selection of drives and their control for traction purposes.***
4. ***Understand the limitation of analogue controller.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Selection of drives for industries	3	3	3	3	2	2	-	-	2	-	-
2. Operation of PLC, contactors and relays	3	3	2	3	3	2	-	-	2	-	-
3. Selection of drives and their control for Traction	3	3	2	2	2	2	-	-	1	-	-
4. Limitation of analogue controller	2	2	2	3	2	1	-	-	2	-	-

ECL320: LINEAR ELECTRONIC CIRCUITS (3-0-0-6)

Objectives

- ***Study of operational amplifiers.***
- ***Understanding working of linear circuits and linear ICs.***

Contents

Basic Operational Amplifier Circuits: Differential Amplifier Stages, Current Source, Biasing, Level Shifting Techniques, Common Mode and Difference Mode Gains and Impedance of a Differential Stage. Overload Protection Circuits, Frequency Response

and Compensation, Characteristics of Ideal and Non-Ideal Operational Amplifier, Error Measurement of Various Parameters

Simple Linear Circuits: Inverting, Non-Inverting Buffer Amplifiers, Summer, Integrator, Differentiator, Log, Antilog, Multipliers, Divider Circuits, Differential Amplifier Configuration, Bridge Amplifiers, Instrumentation Amplifier, Grounding And Shielding Problem In Instrumentation Amplifier
Precision Rectifier, RMS To DC Conversion, Constant Current And Voltage Sources, Sinusoidal Oscillators With Frequency And Amplitude Stabilization, Elementary Idea Of Active Filter With Butterworth 2^{nd} Order Filter Design Procedure

Applications of Operational Amplifier for Clipping Clamping, Comparator Circuits With Nonlinear
Components, Multiplexers, Demultiplexers, Astable Monostable, Bistable Multivibrator Circuits Using OA Sample/ Hold Circuits D/A and A/D Conversion Circuits Phase Locked Loops

Study of Linear ICS like: LM741, LM555, LM565 and LM723

Text/ Reference Books

1. Gayakwad R, Op-Amps and Linear Integrated Circuits, PHI Pub, 4th edition
2. Coughlin R., Driscoll F., Operational Amplifiers and Linear Integrated Circuits, PHI Pub.
3. Tobey, Grames and Huelsman, Operational Amplifiers: Design and Applications, McGraw Hill

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Course Outcomes:

Students are able to

1. ***Understand the basics of operational amplifier.***
2. ***Design linear integrated circuits.***
3. ***Grasp elementary idea of filter design.***
4. ***Know use of different ICs for signal conditioning.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Understand the basics of operational amplifier											
2. Design linear integrated circuits											
3. Idea of filter design											
4. Use of different ICs											

ECP320: LINEAR ELECTRONIC CIRCUITS LAB (0-0-2-2)

1) OP-amp as inverting amplifier
2) OP-amp as non-inverting amplifier
3) OP-amp as integrator
4) OP-amp as differentiator.
5) OP-amp as low pass filter.
6) OP-amp as High pass filter.
7) OP-amp as Schmitt trigger.
8) OP-amp as Comparator.
9) OP-amp as Half wave rectifier.
10) OP-amp as Full wave rectifier.
11) 555 As an Astable multivibrator.
12) 555 As an Monostable multivibrator.

EEL401: ELECTRICAL POWER SYSTEM-II (3-0-0-6)

Objectives

- ***Appreciation of power system concepts.***
- ***Study of fault, stability and economic operation of power system.***

Contents

Symmetrical Component Transformation Three Phase Power in Unbalanced Circuit In Terms Of Symmetrical Component Sequence Impedance of Generator Transformer Transmission Line & Passive Loads Phase Shift In Y/Delta Three Phase Transformer (Yd1, Yd11 Connection)Symmetrical Fault Analysis Without & With Pre-Fault Load Currents. Selection of Circuit Breakers Ratings, Current Limiting Reactors

Unsymmetrical Fault Analysis: L-G, L-L-G-, L-L-L, L-L-L-G, Open Conductors Fault Using Symmetrical Components

Stability of Power System – Steady State Dynamic and Transient Stability Definition and Comparison Dynamics of Synchronous Machine Swing Equation Swing Equation for Single Machine Connected To Infinite Bus, Power Angle Equation. Steady State Stability Studies

Transient Stability Studies: Swing Curve, Equal Area Criterion for Transient Stability Application of Equal Area Criterion for Different Disturbances. Solution of Swing Equation by Point by Point Method of Improving Transient Stability

Economic Operation of Power System: Introduction, Distribution of Load between Units within the Plant. Optimum Generation Scheduling, Considering, Transmission Losses Representation of Transmission Loss Using Loss Formula Co-Efficient Derivation of Loss Formula Co-Efficient Simulation of Co-Ordination Equation on Digital Computer

Grounding Of Neutral in Power System Shunt & Series Compensation Generalized Equation, Shunt Reactor Compensation of Very Long Line with Intermediate Switching Station. Series Capacitor Compensation at Line Centre Shunt Reactor at both Ends and Series Capacitor in Middle of Line Elementary Idea of Sub-Synchronous Resonance Problem and Counter Measures

Text/ Reference Books

1. W.D. Stevenson Jr., Elements of power system analysis, Mc- Graw Hill publications, 3rd Edition
2. I. J. Nagrath, D. P. Kothari, Power System Engineering, Tata Mc- Graw Hill publications 1989
3. O. I. Elgerd, Electric Energy Systems Theory, Mc- GrawHill publications 1971

Course Outcomes

Students are able to

1. ***Apply symmetrical components concepts in fault analysis.***
2. ***Analyze different faults in power system.***
3. ***Appreciate concepts of transient stability.***
4. ***Understand economic operation of power system.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Apply symmetrical components concepts in fault analysis.	3	3	3	3	3	1	3	1	1	2	3
2. Analyze different faults in power system.	3	3	3	3	3	1	3	1	1	2	3
3. Appreciate concepts of transient stability.	3	3	3	3	3	2	3	1	2	2	3
4. Understand economic operation of power system.	3	3	3	2	3	3	2	2	3	2	3

ECP321: MICROPROCESSORS & INTERFACING LAB (0-0-2-2)

LIST OF EXPERIMENTS:

1) Addition of two 16 bit numbers and store 17 bit result in B-C-D registers.
2) Subtraction of two 32 bit numbers stored in BC & HL register pairs. Store result in memory.
3) Subtraction of two 32 bit numbers stored in memory. Store result in consecutive locations (using register indirect Addressing Mode).
4) Subtraction of two 32 bit numbers stored in memory. Store result in memory. (Use direct Addressing Mode).
5) A block of 10 numbers is stored in memory. Arrange these numbers in reverse sequence in a) different memory locations, b) same memory locations.
6) A block of 10 bytes stored in memory. Scan for a byte FFH. If true then stored them in a) different memory locations, otherwise in b) same memory locations.
7) A block of 10 bytes stored in memory. Store all even bytes and odd bytes in different memory locations.
8) Arrange numbers in ascending or descending order in the same memory locations.
9) Solve logical function Y=D2 (D4bar).D5+D2(D3bar)+(D0bar)D7 (D0……..D7 are bits of number in memory).
10) Write subroutine fro generation of delay of 1ms.
11) Generation of square wave and rectangular wave using 8255 and power flow control.
12) Generation of square wave (Varying width) Using 8253.

EEL406: ELECTRICAL INSTALLATION DESIGN (3-0-0-Credits-6)

Objectives:

- ***Study of essentials of electrical installation.***
- ***Study of consumer services, stability of power system and optimization techniques.***

Syllabus:

Planning and Forecasting- Types of Loads, Distribution of Power Loads, Loads and Energy Forecasting. Planning Design and Operation Methodology, System Calculations, Load Flow, Fault Studies Voltage Control, Harmonics Due To Nonlinear Loads, System Losses, Ferro Resonance.

Consumer Services- Supply Industry, Rational Monopoly, Regulations & Other Legal Provisions, Supply Rules, Standards, Consumer Load Requirements Maximum Diversity and Load Factor Determination of Capacity of Distribution/ Power Transformer of Distribution Network, Electric Bill, House Hold Wiring and Protection, ELCB

Grounding- Grounding Systems, Earth and Safety, Types of Potentials, Earth Electrode Sizes, Design of Earthling Electrodes, Earthling Schemes, Earth Tester

Rural Power Supply- Over-Voltage and Protection, Power Capacitors Rural System, Improvement in Existing Distribution System, Concept of Single Phasing, Feeder Separation

System Performance- System Protection Schemes for Distribution Network, System Maintenance, HT- LT Network, Switching Stations

Text Books:

1. A.S. Pabla, “Electronic power distribution system”,1995, Tata McGraw Hills.

Reference Books:

1. E. Lekerai & E.J. Holmes, ‘Electricity distributions network design’, IEE Publications, London,1998.

Faulkenberry, M. Luces & Walter Cofter, Electrical Power Distribution & Transmission, Princtice Hall Inc, 1998.

Course Outcomes

Students are able to

1. ***Analyze and forecast distribution network loads.***
2. ***Know the consumer services.***
3. ***Design grounding systems.***
4. ***Understand rural power distribution system.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Analyze and forecast distribution network loads.	3	3	3	3	3	3	2	1	3	1	2
2. Know the consumer services.	3	3	3	2	2	3	2	2	3	3	3
3. Design grounding systems.	3	3	3	3	3	3	3	1	3	1	2
4. Understand rural power distribution system.	3	3	3	2	2	3	3	2	3	1	2

EEL418: CONTROL SYSTEMS - II (3-0-0-6)

Objectives

- ***Study of nonlinear system, optimal control system.***
- ***State feedback design and tuning of PID controller.***

Contents

Nonlinear Systems: Common Physical Nonlinearities, Phased-Plane Method, Construction Of Phase Trajectories, The Describing Function Method, Derivation Of Describing Functions, Stability Analysis By Phase Plane And Describing Function Method, Liberalized Model Of Nonlinear Systems

Liapunov's Stability Analysis: Liapunov's Stability Criterion, Direct Method of Liapunov, Methods of Constructing Liapunov Functions for Nonlinear System

Sate Variable Design: Concepts of Controllability and Operability, Pole Placement by State Feedback, Observer Systems

Optimal Control Systems: Parameter Optimization, Optional Control Problems: Transfer Function Approach And State Variable Approach, Linear Quadratic Regulator

Realization of PI, PD, PID Controllers, Tuning Rules for PID Controllers

Text/ Reference Books

1. Nagrath & Gopal, Control System Analysis
2. D'Azzo Houpis, Logakusha, Huelsoman, Linear System Analysis, McGraw Hill, 1975
3. Kuo B.C., Automatic Control Systems., Prentice Hall, 1991
4. , Norman Nise, Control System Engineering, John Wiley & Sons Inc, 2000
5. Gopal M., Control Systems- Principle of Design

Course Outcomes:

Students are able to

1. ***Know basics of non-linear system.***
2. ***Find out stability of non-linear system using Liapunov's criteria.***
3. ***Understand state variable analysis.***
4. ***Appreciate concepts of optimal control system.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1.Basics of non-linear system	3	3	2	3	1	1	1	1	1	1	3
2. Stability of non-linear system	3	3	3	3	3	1	1	1	1	2	1
3. State variable analysis	3	3	3	3	3	1	1	1	1	2	1
4. Optimal control system	3	2	3	2	3	1	1	1	1	1	1

SEVENTH SEMESTER

EEL402: HIGH VOLTAGE ENGINEERING (3-0-0- Credits-6)

Objectives:

- ***Understanding the breakdown phenomenon of insulating materials used in electrical system.***
- ***Various high voltage generation and measuring techniques.***
- ***Quality evaluation through testing methodologies in high voltage engineering.***

Syllabus:

Breakdown Mechanism in Dielectrics: Ionization Process, Townsend's Criterion for B.D.: Breakdown in Electro-Negative Gases. In Non-Uniform Fields Corona Discharges and Introduction of Corona, Post B.D. Phenomenon and Applications, Practical Considerations In Using Gases for Insulation Purpose, Vacuum Insulation: Liquid As Insulators. of Solid Di-Electrics in Practice: B.D. In Composite Dielectrics

Lighting and Switching Over Voltages: Mechanism of Lighting, Types of Strokes, Parameter Characteristics Lighting Strokes, Characteristics Switching Surges: Power Frequency Over Voltages Control of O.V. Due To Switching. Protection of Lines by Ground Wires, Protection by Lighting Arrester, Gap Type and Gapless L.A. Selection of L.A. Ratings, Surge Absorbers

Traveling Waves and insulation Co-Ordination: Traveling Waves on Transmission Lines. Classification of Lines Attenuation and Distortion of Traveling Waves Reflection and Transmission of Waves Behaviors of Rectangular Waves at Transition Points Introduction to Insulation Co-Ordination Associated Terms. Impulse Wave-Form Introduction to BIL Reduced BIL and SIL

Generation of High Voltages and Currents: Generation of High D.C. Voltages by Rectifiers. Voltage Doublers and Multiplier Circuits (Derivations of Not Required), Electrostatic Machines. Generation AC Voltages by Transformers Resonant Transformer Generation of High Frequency AC High Voltages, Generation of Impulse Voltages Standard Impulse Wave Shapes Analysis of Model and Commercial Impulse Generation Circuits Wave Shape Control Marx Circuit Tripping and Control of Impulse Generation. Generation of Switching Surges Generation of Impulse Current. Measurement of High AC and DC Voltages by Micro Ammeter

Measurement of High voltage and currents: Generating Voltmeters Resistance and Potential Divider Series Impedance Voltmeters CVT Magnetic Type Potential Transformers. Electrostatic Voltmeter Peak Reading AC Voltmeters Sphere Measurement of Impulse Voltage by Potential Dividers and Peak Reading Voltmeters Measurement of High AC DC Currents Measurement of High Frequency and Impulse Current by Resistive Shunted (Bifillar Strip Shunt Only).

Non Destructive and High Voltage Testing of Electrical Apparatus: Non-Destructive Testing: Measurement of DC Resistively, Measurement of Di-Electric Constant and Loss-Factor (Low and Power Frequency Only), Schering Bridge for High Charging Circuits. For High Dissipation Factor, For Three Terminal Measurement. Transformer Ratio Arm Bridges, Partial Discharge Measurements by Straight Detectors by Balance Detectors, Calibration of Detectors, Discharge Detection in Power Cables High Voltage Testing, Testing of Insulators and S/S Equipments

Text Books:

1. M.S. Naidu, V. Kamaraju, "High Voltage Engineering", Tata McGraw Hill Publishing India, 1999.
2. C.L. Wadhawa, "High Voltage Engineering", Wiley Eastern Ltd, New Age Ltd, India, 1995.

Reference Books:

E. Kuffel, "High Voltage Engineering Fundamentals", Butterworth-Heineman, 2000.

Course Outcomes:

Students are able to

1. ***Understand high voltage breakdown phenomena in insulating materials.***
2. ***Design insulation scheme of electrical machines.***
3. ***Know the generation and measurement of high voltage quantities.***
4. ***Analyze the test procedures as per the standards.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Understand high voltage breakdown phenomena in insulating materials.	3	2	3	2	2	1	1	1	2	1	3
2. Design insulation scheme of electrical machines.	3	3	3	3	3	2	1	1	2	2	3
3. Know the generation and measurement of high voltage quantities.	3	3	3	2	2	2	1	1	2	1	3
4. Analyze the test procedures as per the standards.	3	2	2	1	3	2	1	1	2	1	2

EEP402: HIGH VOLTAGE ENGINEERING LAB (0-0-2-2)

LIST OF EXPERIMENTS:

1. To determine the breakdown voltage of different solid insulating materials.
2. Testing of transformer oil for breakdown voltage.
3. Calibration of voltmeter by sphere gap arrangement.
4. To study different types of line insulators.
5. To study and find the string efficiency of a given string of insulators.
6. To determine the flashover voltage of pin type insulators under dry and wet conditions.
7. To study the corona phenomenon in overhead lines.
8. To study Impulse Generator.

10. Study of Schering Bridge for capacitance and tan δ measurement of insulating material.

EEL403: SWITCHGEAR AND PROTECTION (3-0-0-6)

Objectives

- ***Comprehensive exposure to philosophy and technology of protection.***
- ***Introduction to switchgear.***

Contents:

General Philosophy of Protective Relaying: Protective Zones. Primary Protection Back Up Protection, Remote and Local Back Up, Selectivity. Medium Voltage Line Protection: Over current Relaying Directional over Current Relays

High Voltage Line Protection: Distance Relays, Carrier Distance Schemes. Unit Carrier Schemes

Equipment Protection: Principles of Differential Relaying, Protection of Generator, Transformers and Bus bars by Differential Relaying and Other Relays. Protection of Induction Motor's Against Overload, Short-Circuits, Thermal Release, Miniature Circuit Breaker.

Introduction to Static Relays: Comparison of Static And Electro-Mechanical Relays, Two Input Amplitude And Phase Comparators And Their Duality, Generation of Various Distance Relay Characteristics Using Above Comparators

Switchgear: Circuit Breakers, Arc Interruption Theory, Recovery and Restriking Voltages, RRRV, Breaking Of Inductive and Capacitive Current. C.B. Ratio, Different Media of Arc Interruption, Overview of Oil Circuit Breakers, Construction and Operation of Air Blast, SF6 and Vacuum Breakers

Text Books:

1) C.R. Mason, "Art and Science of Protective Relaying", Wiley Eastern, 1977.

Reference Books:

1) English Electric Relay Application Guide.
2) S.H. Horowitz and A.G. Phadke, "Power System Relaying", John Wiley & Sons/RSP , 2008.
3) Y.G. Paithankar, "Transmission Network Protection: Theory and Practice", Marcel Dekker, 1998.
4) Y.G. Paithankar, S.R. Bhide, "Fundamentals of Power System Protection", PHI Learning, 2010.

Course Outcomes:

Students are able to

1. ***Appreciate the philosophy of protective relaying.***
2. ***Apply Over Current protection for protection of various power system elements.***
3. ***Understand Differential and Protection for transformer , Bus bar and Motor Protection***
4. ***Apply Distance Protection(Carrier and non-carrier) for EHV Lines***
5. ***Comprehend switching phenomenon and the working of various types of circuit breakers and their duties.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1.Philosophy of protective relaying.	3	3	1	1	1	1	0	0	0	1	0
2. Over Current protection	3	3	3	3	2	1	0	0	0	1	0
3.Differential Protection	3	3	3	3	2	1	0	0	0	1	0
4 Distance Protection.	3	3	2	3	2	1	0	0	0	1	0
5 Switchgear	3	3	1	1	1	1	0	0	0	1	0

EEP403: SWITCHGEAR AND PROTECTION LAB (0-0-2-2)

1) Plotting characteristics of IDMT relay
2) Finding through fault stability of a simple differential scheme
3) Plotting characteristics of directional over-current relay
4) Plotting characteristics of Mho relay on R-X plane
5) Study of response of percentage biased differential protection scheme for a 3-phase delta/star transformer for various faults like L-G, L-L, L-L-G, L-L-L and inter-turn faults
6) Plotting characteristics of a simple impedance relay on R-X plane
7) Plotting characteristics of reactance relay on R-X plane
8) Simulation of sine and cosine type comparators in MATLAB/ Simulink

Text Book

1) C.R. Mason, 'Art and Science of Protective Relaying', Wiley Eastern , 1977

Reference Books

1) A.R. Van C. Warrington , Power System Protection Vol.I and Vol II, Chapman and Hall , 1968
2) English Electric Relay Application Guide
3)S.H. Horowitz and A.G. Phadke, ' Power System Relaying',John Wiley & Sons/RSP , 2008
3) Y.G. Paithankar, 'Transmission Network Protection: Theory and Practice', Marcel Dekker , 1998
4) Y.G. Paithankar and S.R. Bhide, 'Fundamentals of Power System Protection', PHI Learning , 2010

EEL409: HVDC (3-0-0-6)

Objectives

- ***To expose the students to the state of the art HVDC technology.***
- ***Methods to carry out modelling and analysis of HVDC system for inter-area power flow regulation.***

Contents

Development of HVDC Technology, DC versus AC Transmission, Selection of Converter Configuration

Rectifier and Inverter Operation, Digital Simulation of Converters, Control of HVDC Converters and Systems, Individual Phase Control, Equidistant Firing Controls, Higher Level Controls

Characteristics and Non-Characteristics Harmonics Filter Design

Fault Development and Protection, Interaction between AC-DC Power Systems.

Over Voltages on AC/DC Side, Multi-Terminal HVDC Systems, Control Of MTDC Systems

Modeling Of HVDC Systems, Per Unit System, Representation for Power Flow Solution, and Representation for Stability Studies

Text/ Reference Books

1. J. Arrillaga, High Voltage Direct Transmission, Peter Peregrinus Ltd. London, 1983
2. E. W. Kimbark, Direct Current Transmission, Vol.I, Wiley Interscience, 1971
3. K. R. Padiyar, HVDC Power Transmission Systems, Wiley Eastern Ltd., 1990
4. Erich Uhlmann, Power Transmission by Direct Current, B.S. Publications, 2004

Course outcomes

Students are able to

1. ***Understand, analyze and model the HVDC long distance bulk power transmission systems.***
2. ***Understand HVDC Control Scheme***
3. ***Understand necessity of HVDC under deregulated environment.***
4. ***Know different protection schemes of HVDC systems***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Analyze and model the HVDC line.	3	2	3	2	2	1	1	-	-	1	3
2. HVDC Control Scheme	3	3	3	2	2	1	1	1	-	1	3
3. HVDC under deregulated environment.	2	2	2	2	3	1	1	1	-	1	3
4. Protection schemes of HVDC systems	2	2	2	2	3	1	1	-	-	1	3

EEL417: ENERGY CONSERVATION AND AUDIT (3-0-0-6)

Objectives

Students are going to learn

- ***Industrial utilization of primary and secondary energy sources.***
- ***Different energy conversion processes.***
- ***Energy auditing procedure.***

Contents

Energy Conservation- Energy Scenario Overview, Basics of Energy and Its Various Forms, Global Environmental Concerns

Energy Efficiency in Thermal Utilities- Fuels and Combustion, Boiler, FBC Boilers, Cogeneration

Energy Efficiency In Electrical Utilities- Electric System, Electric Motors, Fans And Blowers, Pump And Pumping System, Cooling Tower, Lighting System, Energy Efficient Technologies In Electrical System

Energy Assessment- Energy Performance Assessment for Thermal Utilities and Electrical Utilities

Energy Audit- Energy Management and Audit, Material and Energy Balance, Energy Action Planning, Financial Management, Project Management

Text/ Reference Books

1. Giovanni and Petrecca, Industrial Energy Management: Principles and Applications, The Kluwer International Series-207, 1999
2. H.E. Jordan, Energy Efficient Electric Motors and their Applications, Plenum Pub. Corp, 2nd edition, 1994
3. Albert, Plant Engineers and Managers Guide to Energy Conservation, Fairmont Press 10th edition, 2011
4. Albert Thumann, Handbook of Energy Audits, Fairmont press, 5th edition, 1998
5. W.C. Turner, Energy Management Handbook, John Wiley and Sons, 1982
6. Guide books available at www.beeindia.in

Course Outcomes

Students are able to:

1. ***Appreciate importance of energy conservation.***
2. ***Understand the scope of energy conservation in thermal utilities.***
3. ***Grasp the importance of energy assessment.***
4. ***Comprehend various energy auditing methodologies.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Importance of energy conservation.	3	1	1	1	1	1	3	1	3	0	0
2. Energy conservation in thermal utilities	3	1	1	1	2	1	0	1	0	0	0
3. Importance of energy assessment.	3	3	2	2	2	2	1	1	1	0	1
4. Energy auditing methodologies	3	2	1	3	2	1	1	1	2	0	0

EEL410: ADVANCED CONTROL THEORY (3-0-0-6)

Objectives

- ***To teach determination of linear and non-linear systems' relative stability.***
- ***Study of analog and digital control techniques.***

Contents

Review of State Variable Analysis, Controllability and Observability

Digital Control Systems, Models of Digital Control Devices, State Description of Digital Processors and Sampled Continuous Time Plants, Discretisation Of Digital Continuous Time State Equations, Solution Of State Difference Equation.

Controllability and Observability Tests For Digital Control Systems, Stability of Discrete Time Systems, Pulse Transfer Function and Its Realization, Stability Improvement By State Feedback, Pole-Placement Design And State Observers

Lyapunov Stability Analysis: Basic Concepts, Stability Definitions, Stability Theorems, Lyapunov Functions for Linear and Non Linear Systems

Optimal Control: Parameter Optimization Techniques, Lagrange Parameters Techniques, Calculus Of Variation, Unconstrained And Constrained Minimization Of Functional, Two Point Boundary Value Problems, Poynting's Minimum Principle, Optimal Regulator And Tracking Problems, Optimal Digital Control System

Text/ Reference Books

1. M.Gopal, Digital Control and State Variable Methods, Tata McGraw Hill, New Delhi, 1997
2. D.E. Kirk, Optimal Control Theory, Prentice Hall, 1970
3. M.Gopal, Digital Control Engineering, Wiley Eastern, 1988

Course Outcomes

Students are able to

1. ***Understand and analyze dynamical systems.***
2. ***Simulate dynamical systems using MATLAB SIMULINK.***
3. ***Implement the state-space based control techniques.***
4. ***Study the recent advances in control theory.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Analyze dynamical systems	1	2	1	2	2	2	-	1	2	2	3
2. Simulate dynamical systems	2	2	2	2	3	2	1	1	2	3	3
3. State-space based control techniques	3	3	2	2	3	2	1	1	2	3	3
4. Recent advances in control theory	2	2	3	3	3	2	1	1	2	3	3

EEL421: POWER QUALITY (3-0-0-6)

Objectives

- ***To study the aspects of power quality problems.***
- ***Effect of power quality in distribution system is studied.***

Contents

Introduction to Power Quality, PQ Standards, Terms, Definitions

Voltage Sag and Interruptions, Its Sources, Types, Characteristics, Behavior of Different Electric Equipments, Concept of Area of Vulnerability

Voltage Swell And Transient Over voltages, Sources Of Over voltages Like Capacitor Switching, Load Switching, Lightening Etc. Problems Due To Over Voltages, Computer Tools For Transient Analysis

Harmonics Distortions, Voltage And Current Harmonics, THD , Sources Of Other Harmonics, Its Ill Effects, Inter-harmonics, Harmonic Filters, Other PQ Problems Like EMI, Noise, Notching , Flicker , DC Offset.

Typical Wiring and Grounding Problem Causing Poor Power Quality, Solutions to Wiring and Grounding Problem

Need of Measuring and Monitoring Of PQ Problems, Location of Monitoring Equipments and Frequency

Text/ Reference Books

1. Roger C. Dugan, Electrical power system quality, Mc Graw-Hill
2. Alexander Kusko, Power quality in electrical systems, Mc Graw-Hill
3. Ewald Fusch, Power quality in power system and electrical machines, Academic press
4. Math H.J., Understanding power quality problems: voltage sags and interruptions by IEEE press

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Course Outcomes

Students are able to:

1. ***Understand the different power quality indices.***
2. ***Interpret the ill effects of all power quality problems in distribution system.***
3. ***Solve wiring and grounding problems.***
4. ***Analyze harmonics and filters in distribution system modeling and simulation***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Study power quality indices	3	3	3	3	2	2	-	-	2	-	-
2. Ill effects of all power quality problems	3	3	3	3	3	2	-	-	2	-	1
3. Wiring and grounding problems	3	3	3	2	1	2	1	-	2	-	2
4. Analyze harmonics and filters	3	3	3	3	2	2	1	-	2	-	2

EEL407: ELECTRIC POWER DISTRIBUTION SYSTEM (3-0-0-6)

Objectives

- ***Learning about power distribution system.***
- ***Study of automation- SCADA.***

Contents

Load and Energy Forecasting: Distribution of Power, Management, Power Loads, Load Forecasting, Power System Loading, Technological Forecasting. Need Based Energy Management (NBEM) – Objectives, Advantages, Distribution Management System (D.M.S.)

Distribution Automation: Definition, Restoration / Reconfiguration of Distribution Network, Different Methods and Constraints. Interconnection of Distribution, Control & Communication Systems

SCADA: Introduction, Block Diagram, SCADA Applied To Distribution Automation. Common Functions of SCADA, Advantages of Distribution Automation through SCADA

Calculation of Optimum Number of Switches, Capacitors, Optimum Switching Device Placement in Radial, Distribution Systems, Sectionalizing Switches – Types, Benefits, Bellman's Optimality Principle, Remote Terminal Units.

Maintenance of Automated Distribution Systems, Difficulties in Implementing Distribution

Automation in Actual Practice, Urban/Rural Distribution, Energy Management

Text/ Reference Books

1. Pabla A.S., Electric Power Distribution, Tata McGraw Hill Publishing Co. Ltd., Fourth Edition
2. Khedkar M.K., Dhole G.M., Learning Material for Electrical Power Distribution, 2004

Course Outcomes

Students are able to:

1. ***Understand concepts of SCADA and energy management system.***
2. ***Analyze the optimizing techniques in DMS.***
3. ***Reconfigure the distribution network.***
4. ***Solve various distribution system problems(Restoration / Reconfiguration)***
5. ***Understand actual practices in Rural/Urban distribution system.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solution	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Concepts of SCADA and energy management system	3	2	2	3	3	2	2	1	-	-	1
2. Analyze the optimizing techniques	3	3	3	3	3	2	3	1	-	-	1
3 Restoration / Reconfiguration	2	2	3	2	2	1	1	1	-	-	1
4. Rural/Urban distribution system	2	2	3	2	2	2	1	1	-	-	1

EIGHTH SEMESTER
EEL404: SAMPLED DATA AND DIGITAL CONTROL (3-0-0-6)

Objectives

- ***The basics of sampling and data processing are covered.***
- ***Data in sampled form is used for controlling purpose.***

Contents

Sampling And Data Reconstruction Processes: Sampled – Data Control Systems, Ideal Sampler, Sampling Theorem, Sample And Hold Operations, Frequency Domain Considerations

Z-Transforms: Properties Inverse, Applications to Solution of Difference Equations, Convolution Sums

Stability Of Discrete Systems: Location of Poles, Jury's Stability Criterion, Stability Analysis through Bilinear Transforms

Design of Digital Control Systems: PID Controllers and Frequency Domain Compensation Design

State Variable Methods and the Discrete Linear Regulator Problem

Text/ Reference Books

1. M.Gopal, Digital Control Engineering and State Variable Methods, Tata McGraw-Hill, 1997
2. K.J. Astrom and B. Wittenmark, Computer Controlled Systems, Prentice-Hall India 1994
3. R.Isermann, Digital Control Vol.1, Narosa Publications, 1993

Course Outcomes:

Students are able to

1. ***Basics of sampling and data processing.***
2. ***Modeling of digital filters and systems.***
3. ***Analysis of digital systems in time domain and frequency domain.***
4. ***Design and analysis of digital system in state space.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1 Basics of sampling and data processing	1	2	1	2	2	2	-	1	2	2	3
2. Modeling of digital filters	2	2	2	2	3	2	1	1	2	3	3
3 Analysis of digital systems in time and frequency domain	3	3	2	2	3	2	1	1	2	3	3
4. Analysis of digital system in state space	2	2	3	3	3	2	1	1	2	3	3

EEL408: ADVANCED POWER ELECTRONICS (3-0-0-6)

Objectives

- ***To impart knowledge of recent and advanced developments in PE area.***

Contents

Overview of Power Semiconductor Devices, DC-DC Converters- Principle of Operation of Buck, Boost, Buck-Boost, flyback, forward, push-pull, half bridge and isolated converters

Input and output filter design, multi output operation of isolated converters

Design of transformers and inductors, modeling of the converters using state averaging techniques

Resonant inverters: DC link inverters, modified circuit topologies for DC link voltage clamping, voltage control-PWM techniques, quasi resonant inverters

DC-DC converters- series resonant and parallel resonant, application of zero voltage and zero current switching for DC-DC converters (buck and boost), inverters for induction heating and UPS

Text/ Reference Books

1. Mohan N, Undeland T.M., Robbins W. P., Power Electronics, Converters, Applications and Design, John Wiley & Sons, 1995
2. Rashid M. H., Power Electronics, Circuit, Devices and Applications, Prentice-Hall of India, 3rd Edition 2000
3. Lander C. W., Power Electronics, McGraw Hill, 1993
4. Bausier R., Seguier G., Power Electronic Converters, Springer-Verlag, 1987

5. D.M. Mitchell, DC-DC Switching Regulator analysis, TMH, 1987

Course Outcomes
Students are able to:

1. ***Design converters.***
2. ***Improve the converter performance by analyzing and implementing different control techniques***
3. ***Understand various applications of converters.***
4. ***Solve the complex problems.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Design converters	3	3	3	2	1	1	1	1	1	1	3
2. Improve the converter performance	3	2	3	2	1	1	1	1	2	1	3
3 applications of converters	3	3	2	2	2	1	-	1	2	-	3
4. Solve complex problems	3	3	2	2	1	1	1	1	1	1	3

EEL411: APPLICATION OF POWER ELECTRONICS TO POWER SYSTEMS (3-0-0-6)

Objectives
Students are able to: Understand the concept of active and reactive power compensation, Concept, operation and analysis of FACTs devices and use of FACTs devices to overcome transmission bottle necks and improvement of power Quality

Contents
Introduction of Semiconductor Devices, Steady State and Dynamic Problems in AC Systems, Power Flow
Flexible AC Transmission Systems (FACTS): Basic Realities & Roles, Types of Facts Controller, Principles of Series and Shunt Compensation
Description of Static VAR Compensators (SVC), Thyristor Controlled Series Compensators (TCSC), Static Phase Shifters (SPS), Static Condenser (STATCON), Static Synchronous Series, Compensator (SSSC) and Unified Power Flow Controller (UPFC)

Modeling and Analysis of FACTS Controllers, Control Strategies to Improve System Stability, Power Quality Problems in Distribution Systems

Harmonics, Harmonics Creating Loads, Modeling, Series and Parallel Resonances, Harmonic Power Flow, Mitigation of Harmonics, Filters, Passive Filters, Active Filters, Shunt, Series, Hybrid Filters, Voltage sags and swell, voltage flicker, mitigation of power quality problems using power electronics conditioners

Text/Reference Book

1. N.G. Hingorani, Understanding of FACTs, IEE press
2. T.E. Accha, Power Electronics Control in Electrical Systems, New NES (Elsvier) Publications 2006
3. G.T. Heydt, Power Quality, Stars in a Circle Publications, Indiana, 1991
4. T.J.E. Miller, Static Reactive Power Compensation, John Wiley & Sons, New York, 1982
5. Yong Hua Song, Flexible AC transmission system (FACTS)
6. Recent publications on IEEE Journals

Course Outcomes

Students are able to understand application of FACTS devices

1. ***To maintain voltage profile and stability***
2. ***To enhance power transmission capability of transmission lines***
3. ***To control active and reactive power flow***
4. ***To enhance power quality in distribution system***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Maintain voltage profile and stability	3	2	2	2	1	2	2	0	1	0	2
2. Enhance power transmission capability	3	3	2	2	1	2	2	0	2	0	2
3. Control of active and reactive power	3	3	2	2	1	2	2	0	2	0	2
4. Enhance power quality	3	2	2	2	1	2	2	0	1	0	2

EEL412: DSP APPLICATIONS TO POWER SYSTEM (3-0-0-6)

Objectives

- ***To make students aware of need and advantages of DSP techniques.***
- ***Appreciation of state of the art approach to digital solutions.***

Contents

Overview of the Application of Information Processors in Power System Need For Numerical (Digital / Computer Based) Controllers. Basic Structure of DSP Based Systems:. Power System & DSP System Interface: Signal Transducers, Signal Conditioning: .Data Conversion System Analysis And Design: (Sampling: Shannon's Sampling Theorem, Phenomenon Of Aliasing, Anti-Aliasing Filter Design, Sampling Process, Necessity Of Sample & Hold , Choice Of Sampling Frequency, A/D & D/A Conversion And Quantization Noise, Techniques Of Reducing Quantization Noise, Over-Sampling ADC , Sigma Delta Modulator)Introduction To General Purpose Digital Signal Processors:

Computer Architecture for Signal Processing, Special Purpose DSP Hardware, DSP Arithmetic, ADC Quantization Noise and Signal Quality, Finite World Length Effects, Correlation & Discrete Transform (DFT , Wavelet, Etc) Techniques for Extraction of Fundamental and Harmonic Components Form the Voltage and Current Waveform Samples. DSP Based Relays; Discrete Time FIR and IIR Filters For Implementations of Numerical Relay Algorithms. Power Electronics System Controllers, Some Simple Schemes

Text/ Reference Books

1. A.T. Johns, S.K. Salman, Peter Peregrinus, Digital protection for Power Systems, IEE–U.K. 1995

2. Emmanuel C., Ifeachor, Barrie W Jervis, Digital signal processing (A Practical Approach), Pearson Education Asia, second Edition

3. Alan V Oppenheim, Ronald W Schafer, Discrete time signal Processing, Prentice Hall of India (private)
Limited, New Delhi, 1994

4. Vinay K Ingle , John G Proakis, Digital Signal Processing Using MATLAB Broks/Cole Publishing Company

5.Prabhakar S Naidu, Modern Digital Signal Processing, Narosa Publishing house New Delhi, second edition 2006

Course Outcomes

Students are able to

1. ***Understand concepts of signal conditioning and sampling.***
2. ***Apply various algorithms for estimation of sinusoidal signals.***
3. ***Use DFT and FFT techniques.***
4. ***Design FIR and IIR filters for digital relays.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solution	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1 concepts of signal conditioning and sampling	3	3	1	2	1	-	-	-	-	-	-
2. estimation of sinusoidal signals	3	3	3	3	3	-	-	-	-	-	-
3. DFT and FFT techniques	3	3	3	3	3	-	-	-	-	-	-
4. FIR and IIR filters for digital relays	3	3	3	3	3	-	-	-	-	-	-

EEL414: MICROPROCESSOR APPLICATIONS IN POWER ELECTRONICS AND POWER SYSTEMS (3-0-0-6)

Objectives

- ***To learn architecture and instruction set of a processor.***
- ***To learn embedded c programming.***
- ***To study interfacing concepts and applications in area of power system and power electronics.***

Contents

Review of Microprocessors, Architecture, and Programming of 8085 Microprocessor, Its Interfacing with Data Converters

Various Programmable Interface Devices Such As Multipurpose Programmable Device 8155, Programmable Peripheral
Interface 8255, Programmable Counter 8254, DMA Controller 8257, Programmable Interrupt Controller 8259, and Programmable Keyboard / Display Interface 8279, Serial I/O and Data Communication

Microprocessor Vs Microcontroller, Architecture and Programming of 8051 Microcontroller: Special Function Registers,
Internal RAM and ROM, Interfacing With External Memory, Programmable Built In Ports, On Chip Counters / Timers, Serial Data
Input/Output, Interrupts, Assembly Language Programming and Applications

Op-Amp Based Analog Signal Conditioning Circuits, Analysis and Design of Inverting, Non- Inverting and Instrumentation

Amplifiers, Filters and Comparators, Clippers, Clampers and Precision Rectifier Circuits

Microprocessor Based Applications: Measurement of Various Electrical and Non-Electrical Parameters, Speed Monitoring

Control of Various Motors, Control of Firing Circuits of Power Electronics Systems, Numerical Protective Relays Etc

Text/ Reference Books

1. Gaonkar, Ramesh S., Microprocessor Architecture, Programming and Applications with the 8085, Penram International,1997
2. Ayala, Kenneth J., the 8051 Microprocessor Architecture, Programming and Applications, Penram International, 1996
3. Gayakwad, Ramakant A.,Op-amps and Linear Integrated Circuits, Prentice Hall of India, 1998

Course Outcomes

Students are able to:

1. ***Understand basics of microprocessor and microcontroller.***
2. ***Program processor with assembly language as well as 'C' language.***
3. ***Design processor based applications.***
4. ***Use simulator / hardware for verifying circuit design.***

EEL413: ADVANCED ELECTRICAL DRIVES AND CONTROL (3-0-0-6)

Objectives

- ***Understand the modeling of AC/DC machines.***
- ***Design procedure of controllers in closed loop operation.***
- ***Various new control methods to improve the performance of the motors in industrial applications.***

Contents

Dynamics of Electric Drives: Basic Elements of an Electric Drives, Classification of Electric Drives, Stability Consideration of Electric Drives.

Analysis of Electric Machinery: Voltage And Torque Equations In Machines Variables, Theory Of Direct Current Machines, Theory Of Symmetrical Induction Machines, Theory Of Synchronous Machines, Reference Frame Theory, Literalized Machine Equations

Solid State Converters For Drives: Solid State Converters For DC Drive System, Speed Control Techniques, Variable Frequency Control Of A. C. Motors Using Inverters, Slip Energy Recovery And Rotor Resistance Control Of Induction Motor..

Control of DC/AC Machines: State Variable Approach, Scalar / Vector Control of Induction Motors,

Digital Control of Drives: Application of Microprocessors / Computers in Electrical Drives Control, Switch Reluctance Motors and Permanent Magnet Brushless Dc Motors

Text/ Reference Books

1. Dubey G.K., Fundamentals of Electrical Drives, CRC Press, 2002
2.
3. 'Krause P.C., Analysis of Electrical Machinery, McGraw Hill 1987

4. Bose B.K., Power Electronics and AC Drives, Printice Hall, NJ, 1985
5. Leonhard W., Control of Electrical Drives, Narosa Publishing House, India 1984
6. Bridges I. & Nasar S.A., Electric Machine Dynamics, Macmillan Publishing Company, NY, 1986
7. Krishnan, R., Electric Motor Drives, Modelling, Analysis and Control, Prentice Hall India, 2003

Course Outcomes

Students are able to

1. ***Design of drives for industrial applications.***
2. ***Energy conservation in drives systems using different controls.***
3. ***Analysis of drives performance under various dynamical operating conditions.***
4. ***Operation of new electrical machines with digital control.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Drives for industrial applications.	3	2	2	2	2	1	1	-	-	-	1
2. Energy conservation in drives system	3	2	2	3	2	1	1	-	-	-	2
3. Analysis of drives.	3	3	3	3	2	1	-	-	-	-	1
4. Operation of new electrical machines	3	2	3	3	3	1	-	1	-	-	2

EEL416: RENEWABLE ENERGY SYSTEMS (3-0-0-6)

Objectives

- ***To learn the principles of generating Heat Energy and Electrical energy from Non-conventional / Renewable Energy Sources.***
- ***To gain understanding of the working of Off-grid and Grid-connected Renewable Energy Generation Schemes.***

Contents

Non-Conventional Sources of Electrical Energy – Solar, Wind, Geo-Thermal, Ocean, Tidal, Wave, MHD and Biomass; Their Scope and Potentialities for Energy Conversion

Solar Energy – Introduction, Physical Principles of Conversion of Solar Radiation into Heat, Solar Energy Collectors, Solar Energy Storage, Solar-Electrical Power Generation and Other Miscellaneous Applications of Solar Energy

Wind Energy – Introduction, Basic Principle Of Wind Energy Conversion, Wind Data And Energy Estimation, Site Selection, Basic Component Of Wind Energy Conversion System, Wind Turbines And Their Analysis, Wind-Electrical Generation. Stand-Alone and Grid Connected Wind-Electrical Power System, Various Applications of Wind Energy.

Tidal Energy- Introduction, Basic Principles of Tidal Power, Site Selection, Storage, Single and Double Effect Tidal Schemes, Analysis of Tidal Energy Plant

Ocean Energy- Introduction to Wave Energy Based Power Plants, Advantages and Disadvantages, Analysis of Wave Energy Plant

Distributed Generation

Text/Reference Books

1. Rao and Parulekar, Energy Technology, Khanna Publishers, New Delhi, Second reprint 2002
2. G.D Rai, Non-conventional Energy Sources, Khanna Publishers, New Delhi, tenth reprint 2002
3. S.P. Sukhatme, J.K. Nayak, Solar Energy, Tata Mc Graw hill Publishing Co. Ltd., New Delhi 2007
4. B. H. Khan, Non-conventional Energy Resources, TMH, 2006

Course Outcomes

Students are able to

1. ***Understand the characteristics of non-conventional energy sources.***
2. ***Know working of off-grid renewable energy generation scheme.***
3. ***Know working of grid-connected renewable energy generation scheme.***
4. ***Grasp basics of distributed generation system.***

POs / COs	a. Knowledge	b. Analyzing the processes	c. Design	d. Research and complex problem	e. State-of-art (Modern Tools)	f. Society	g. Sustainable technical solutions	h. Ethical principles	i. Individual and Team Work	j. Communication	k. Life long learing
1. Characteristics of NCES	3	3	3	2	1	3	2	0	3	2	0
2. Know working of off-grid renewable energy generation scheme.	3	3	3	2	1	2	2	0	3	2	0
3. Know working of grid-connected renewable energy generation scheme.	2	3	2	2	1	2	2	0	3	1	0
4. Grasp basics of distributed generation system.	3	2	2	2	1	1	1	0	2	1	0

EEP415 COMPUTER APPLICATION IN ELECTRICAL ENGINEERING LAB (0-0-2-2)

LIST OF EXPERIMENT:

Simulation based on following softwares:
MATLAB (SIMULINK)
PSPICE
Alternative Transients Program (ATP)
PSCAD,
PowerWorld Simulator.

Annexure III

Dr. A. G. Kothari has specialized in H V D C systems. Has contributed 56 papers in reputed journals and conferences. Right from 1972 to the present he has taught M tech (IPS) courses like Controls Systems I , Control Systems II , Power System Stability , Power System Dynamics , HVDC Systems over the years. He is an accomplished teacher with vast experience.

Dr. K. L. Thakre has specialized in Power System Protection in particular and Power Systems in general. He has developed many courses like Microprocessor Applications to Power Systems, Applications of Power Electronics to Power Systems, Power Station Practice, Control Systems, and Economic Operation of Power Systems. He has publications to his credit in reputed International and National journals and conferences. He is a gifted teacher with keen interests in wide areas of Electrical Engineering.

Dr. H. M. Suryawanshi has specialized in Power Electronics and Power System. He taught Power Electronic Design, Advanced Power Electronic Drives, PE Converters. He has published 53 research papers in reputed International Journals and about 100 papers in national and international conferences. He has undertaken and successfully completed sponsored research projects in the area of design of soft switched converters and inverters. The NAMPET project is one of such projects. He is a fellow of National Academy of Engineering (FNAE).

Dr. M. V. Aware has specialized in High voltage Engineering, Electrical Drives and control, Efficient Energy Conversion, Power Quality. He has developed the courses :- Electrical drives –I, Electrical drives –II, Advanced Power Electronics, Electrical Power Utilisation, Energy Conservation and Audit, Electrical Installation Design. He has ten years of industrial experience. His main research interests are in the area of Energy Storages and Multiphase Drives.He has published more than 150 papers in International/ National Journals/ conferences. He has contributed chapters in three books and also the monogram. He has completed International/Sponsered Reseach projects and many consultancy projects in the area of energy audit and conservation.He was awarded an Academic Commonwelth fellowship in UK (2011-12) and also visited more than 25 univercities abroad.

Prof. V. N. Rajurkar has specialized in Power System Economics, Energy System Managent, Control Systems , Power System Stability , Power System Dynamics, Renewable Energy Systems. He has published 15 research papers.

Dr. S. R. Bhide has specialized in Digital Protection of Power Systems. He has co-authored a text book on Power System Protection (2003 , PHI , New Delhi). The book is presently in its 2^{nd} Edition (2010) and its 12^{th} printing (March 2013). He has developed courses like Integrated Electronics now replaced by Numerical Protection of Power Systems, Artificial Intelligence Based Systems, and Microprocessor Applications to Power Systems. He has published 40 papers in reputed National and International journals and conferences. He is an accomplished teacher with 29 years of teaching experience.

Dr. B. S. Umre has specialized in Power Systems. He has worked in the area of tensional oscillations in turbo-generators. He has taught courses like Electric Machines I and Electric Machines II. He has published 18 research papers. He has presented papers in USA in 2007, 2010 and 2013.

Dr. V. B. Borghate has specialized in Power Electronics. He has taught courses like Electric Machine Design, Special Topics in Power Electronics, Power Electronics, Advanced Power Electronics etc. He has developed courses like Electric Machine Design, Special Topics in Power Electronics. He has published 20 research papers in reputed Journals and Conferences.

Dr. Mrs. M. A. Chaudhary has specialized in Power Electronics. She has published 16 research papers. She has developed courses like Processor Applications in Electrical Engineering, Advanced Power Electronics, and Electrical Drives etc.

Dr. P. S. Kulkarni has specialized in Renewable Energy Sources. He has taught course like Power System Dynamics, Power System Stability, Renewable Energy Systems to M Tech (IPS) class. He has undertaken and successfully completed an MHRD sponsored research project in 2004-2007 in the area of enhancement of power system stability. The outlay of the project was Rs. 7 Lakhs. He has 41 research papers to his credit in reputed International and National journals and conferences.

Dr. M. R. Ramteke has specialized in Power Electroics. He has published 31 research papers in reputed International and National Journals and Conferences. He has contributed to development of courses like Power Electronics , Multi Level Inverter Design , Advanced Drives etc.

Dr. S. S. Bhat has specialized in Power System Stability. He completed his Ph D from IIT, Delhi. He also has expertise in Computer Programming. He has developed courses like MATLAB programming , Utilization of Electrical Energy. He has association with Prof. Van Cutsem at Univ. of Leige, Belgium, where he has done post-doctoral work on Power System Blackout in Nov.- Dec. 2010. He has published 18 research papers in reputed journals and conferences. He has pioneered the use of Power System Analysis software ‘Euro-Stag.

Dr. Mrs. A. S. Junghare has specialized in Power System area. She has published 15 research papers. She has taught Controls Systems I , Control Systems II , Distributed Data Digital Control Systems. She has developed courses like Control Systems I and II and Distributed Data and Digital Control.

Dr. M. S. Ballal has specialized in Power System. He has published research papers in reputed National and International Journals. He has contributed to the development of Electrical Estimation and Design.

Dr. V. S. Kale has specialized in Artificial Intelligence Applications to Power Systems. He has developed courses like MATLAB programming, Microprocessor Applications to Power Systems. He has taught Power System Protection, Control Systems , Microprocessor Applications to Power Systems, Numerical Protection of Power Systems etc, to UG and PG classes. He has 36 research papers to his credit.

Prof. S.R. Tambay has specialized in the general area of Power Systems with

specialization in Power System Protection, Electrical Machines , Power System Stability , Power System Dynamics. He has pioneered the use of EMTP for power system studies in the Department. He has 8 research publications to his credit. Currently he is perusing his Ph D in the area of Wide Area Protection and Control using synchrophasor techniques at VNIT, Nagpur.

Dr. Mrs. N. R. Patne has specialized in the area of Power Systems. She has 13 research papers to her credit. She has contributed to the development of Power Quality, Electric Power Systems II.

Prof. A. S. Dhabale has contributed to the development of Advanced Electrical Drives. He has 2 research publications to his credit.

Prof. R.J. Satputaley is currently pursuing her Ph D at VNIT, Nagpur in the area of Power Quality. She has published 03 papers journal and 08 papers in the National and International Conferences. She has contributed to the development of subject Power Quality and Electric Drives.

Dr. Swapanjit Pattnaik has specialized in the area of Power Electronics. He has published 07 papers.

Annexure IV

List of faculty Journal publications

2014-2015

[1]. S.P. Gawande, M.R. Ramteke, "State feedback based capacitor voltage equalization scheme in distribution static compensator for load compensation," IET Generation, transmission, distribution, PP. 1-10, June 2015. DOI 10,1049/iet-gtd.2014.0950.

[2]. Pavan Kumar V. and Kulkarni P.S, "Multi-layered feed-forward back propagation neutral network approach for solving short term terminal unit commitment," The Journal of CPRI,Vol.11, No. 1, March 2015 pp.27-36

[3]. Bhimrao.S. Gajbhiye, M.V. Aware, B.S. Umre, Rajesh Patil, "Single phase to three phase ac Matrix Converter for Traction Drives," IOSR-JEEE, Vol. 10, Issue 2 Ver. II, Mar-April 2015, pp 10-18.

[4]. Prafullachandra M. Meshram, V.B. Borghate, " A Simplified Nearest Level Control (NLC) Voltage Balancing method for Modular Multilevel Converter (MMC)," IEEE Transactions on Power Electronics, Vol.30, No.1, January 2015.

[5]. Arvind R.Singh, Nita R. Patne, V.S.Kale, "Adaptive distance protection setting in the presence of mid-point STATCOM using synchronized measurement," Electrical Power and Energy Systems 67(2015) 252-260, Elsevier Ltd.

[6]. M.S.Ballal, H.M.Suryawanshi, B.N.Choudhari, "Extended Wing Technique Approach for the Detection of Winding Interturn Faults in Three-phase Transformers," Journal of Power Electronics, Vol.15, No.1,pp.288-297, January 2015.

[7]. Rashmi A. Keswani, H. M. Suryawanshi, M. S. Ballal, "Multi-Resolution analysis for converter switch faults identification", IET Power Electronics 2015.

[8]. P.A. Venikar, M.S. Ballal, B.S. Umre, H.M. Suryawanshi, "A Novel off-Line to on-line Approach to detect Transformer Inter-Turn Fault," IEEE Transactions on Power Deliovery, DOI :10.1109/TPWRD.2015.2440448.

[9]. Shelas Sathyan, H.M. Suryawanshi, M.S. Ballal, A.B. Shitole, "Soft Switching DC-DC Converter for Distributed Energy Sources With High Step Up Voltage Capability," IEEE Transactions on Industrial Electronics, DOI :10.1109/TIE.2015.2448515.

[10]. Makarand S. Ballal, Hiralal M. Suryawanshi, Mahesh K. Mishra, Bhupesh N. Chaudhari, "Interturn Faults Detection of Transformers by Diagnosis of Neutral Current," IEEE Transactions on Power Delivery, DOI :10.1109/TPWRD.2015.2461433.

[11]. R.J. Satputaley, V.B. Borghate, M.A. Chaudhari, B.H. Naik, "Hardware Enactment for Sagacious Compensation by Single Phase Dynamic Voltage Restorer," Asian Power Electronics Journal, Vol. 8, No. 2, Nov 2014.

[12]. Amarendra Matsa, Irfan Ahmed M. A. Chaudhari, "Optimized Space Vector Pulse-width Modulation Technique for a Five-level Cascaded H-Bridge Inverter" Journal of Power Electronics (JPE), vol. 14, pg 937-945, Sep-2014.

[13]. Ankur Kumar Gupta, R.J.Satputaley, "A Control Scheme for Dynamic Voltage Restorer using PSCAD," International Journal for Scientific Research & Development, Vol. 2, Issue 02, 2014.

[14]. V.B.Virulkar , M.V.Aware, "Flicker Detection, Measurement and Means of Mitigitation: A Review", J.Inst.Eng.India Ser.B, April – June 2014.

[15]. M.S.Ballal,D.M.Ballal, H.M.Suryawanshi, M.K.Mishra, "Corrective Measures for the Effective Load Management and Control Under Disturbance at Bhusawal Thermal Power Station: Case Study," Article of Professional Interests, DOI 10.1007/s40031-014-0082-3.

[16]. M.S.Ballal, H.M.Suryawanshi, D.M.Ballal, M.K.Mishra, "Special Protection Scheme at BTPS Power station," Journal of IE(I), Article of Professional Interests, DOI 10.1007/s40031-014-0169-x.

[17]. Ashutosh S. Werulkar, P.S.Kulkarni, "Energy Analysis of Solar Home Lighting System with Micro-controller based Charge Controller," Journal of Solar Energy Engineering, August 2014, Vol. No.136/ 031010-1.

[18]. M.S.Ballal,D.M.Ballal, H.M.Suryawanshi, M.K.Mishra, "Corrective Measures for the Effective Load Management and Control Under Disturbance at Bhusawal Thermal Power Station: Case Study," Article of Professional Interests, DOI 10.1007/s40031-014-0082-3.

[19]. Rashmi A.Keswani, H.M.Suryawanshi, M.M.Renge, "Wavelet Modulus Maxima for Single Switch Open Fault in Multi-level Inverter," Electric Power Components and Systems, ISSN:1532-5008,DOI :10.1080/153250083.2014.903538.

[20]. S.P. Gawande, M.R. Ramteke, "Current Controlled PWM for Multilevel Voltage-Source Inverters with Variable and Constant Switching Frequency Regulation Techniques: A Review," Journal of Power Electronics, Vol. 14, No. 2, pp. 302-314, March 2014.

[21]. S.P.Gawande and M.R.Ramteke, "Three-level NPC inverter based new DSTATCOM topologies and their performance evaluation for load compensation", (Elsevier) Journal - Electrical Power and Energy System(61), 2014, pp. 576-584

[22]. Altaf Badar, B. S. Umre and A. S. Junghare, "Study of Artificial Intelligence Optimization Techniques applied to Active Power Loss Minimization", IOSR Journal of Electrical and Electronics Engg (IOSR-JEEE), ICAET-2014, Volume 2, pp 39-45.

[23]. Altaf Badar, B. S. Umre and A. S. Junghare, "Improved Dynamic PSO for Optimal Reactive Power Flow Control", International Journal on Recent and Innovation Trends in Computing and Communication, ISSN: 2321-8169, Feb 2015, Vol 3, Issue 2, pp. 40-42.

[24]. J.S.Bhosle, A.S.Junghare, "Application of MCDM - AHP Technique for PMU Placement in Power System", IEEE International Conference on Computational Intelligence & Communication Technology 2015, 978-1-4799-6023-1/15 $31.00 © 2015 IEEE. DOI 10.1109 /CICT.2015.127, pg. No. 513-517, BEST PAPER AWARD (JOURNAL)

[25]. J.S.Bhosle, A.S.Junghare, "An Optimal PMU-PDC Placement technique in Wide Area Measurement System" , IEEE Conference ICSTM 2015, Chennai on 6th-8th May 2015, BEST PAPER AWARD (JOURNAL)

[26]. J.S.Bhosle, A.S.Junghare, "Optimal placing of PMUs in constrained grid : An approach" , Turkish Journal of Electrical Engineering & Computer Sciences, Available online: 11.08.2015 DOI: 10.3906/elk-1405-116 , 11-08-2015.

2013-14

[1]. S.P.Gawande, M.R.Ramteke and S.Khan ,"Design consideration for configuration, topology and control scheme of DSTATCOM implemented on distribution system, "Lecture Notes on Information Theory Vol.1,No.3 Sept 2013 , Engineering and Technology publishing, pp.89-94,March2013

[2]. H.M. Suryawanshi, U.V. Patil, M.M. Renge, K.D. Kulat, "Modified Combined DTC and FOC based Control for Medium Voltage Induction Motor Drive in SVM Controlled DCMLI," EPE Journal, Vol.23, No.4, December 2013.

[3]. M. V. Aware, "Six-phase inverter operation with SVPWM for a symmetrical single neutral load," Electrical Power Components and systems, Taylor and Francis, 41:16, 1635-1653, DOI: 10.1080/15325008.2013.835358.

[4]. Irfan Ahmed,V.B. Borghate, "Simplified space vector modulation technique for Seven-level cascaded H-Bridge Inverter," IET Power Electronics, July 2013, DOI :10.1049/iet-pei.2013.0135.

[5]. Mahesh Pandya and Mohan V Aware, "Energy storage sizing to improve the distribution line performance" The journal of CPRI, Vol.9, No.4, Dec 2013, pp.485-490.

[6]. M. S. Ballal and H. M. Suryawanshi, "A Soft-Transition Control Strategy of Multilevel Inverter for Three-Phase Induction Motor Drive," Asian Power Electronics Journal, Vol. 7, No. 1, Sep 2013, pp.30-35.

[7]. Ashutosh Werulkar, D. Shankar and P.S.Kulkarni, "A Soft Switching Boost Converter with Simulation of Maximum Power Point Tracking for Solar Home Lighting System," International Journal of Chem. Tech Research, April-June 2013, Vol.5, No.2, pp 935-946.

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[12]. Arora, T.; Aware, M.; Tutakne, D. (2013), "Life Estimation of Induction Motor Insulation under Non-Sinusoidal Voltage and Current Waveforms Using Fuzzy Logic", World Academy of Science, Engineering and Technology, International Science Index

84, International Journal of Electrical, Electronic Science and Engineering, 7(12), 1703 - 1711.

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[3]. U.V. Patil, H.M. Suryawanshi, M.M. Renge, "Closed-loop Hybrid Direct Torque Control for Medium Voltage Induction Motor Drive For Performance Improvement", IET Power Electronics, pp 31 -40, DOI 10.1049/iet-pel.2012.0509, 2012.

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[5]. Altaf Badar, B. S. Umre, Mrs. A. S. Junghare, "Reactive Power Control using Dynamic Particle Swarm Optimization for Real Power Loss Minimization", International Journal of Electrical Power and Energy Systems, 2012, pp 133-136.

[6]. M. S. Ballal and H. M. Suryawanshi, "Corrective Measures in Islanding Scheme at Bhusawal Thermal Power Station –Case Study," International Journal of Emerging Electric Power Systems, Volume 13, Issue 2, June 2012.

[7]. U. V. Patil, H. M. Suryawanshi, M. M. Renge, "Torque Ripple Minimization in DTC Induction Motor Drive Using Space Vector Controlled Diode Clamped Multilevel Inverter," Electrical Power components and Systems (EPCS), Taylor & Francis, Vol. 40, May-2012**,** pp.792-806**,** U. K.

[8]. R. J. Satputaley, V. B. Borghate, K. L. Thakre, N.R. Patne, "Dynamic Voltage Restorer with Repetitive Controller for Power Quality Improvement,'' International Journal of Power System Operation & Energy Management, vol.1, issue 3,2011.

[9]. A. K. Mishra, M. R. Ramteke and H. M. Suryawanshi, "Comparative Evaluation of AC-DC Converters for Input Current Harmonics: A Study," European Association for Renewable Energies and Power Quality, Spain, N0.10, April 2012.

[10]. S. W. Mohod, S. M. Hatwar, M.V. Aware, "Wind energy generation interfaced system with power quality and grid support," Advanced Material Research, Vols. 403-408, 2012, pp.2079-2086.

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Prof. M.V. Aware

[1].Contributed Chapter "Power Quality and Grid Code Issues in Wind Energy Conversion System" Chapter in the book, "An Update on Power Quality", pp. 21-36, Published by INTECH, 2013.

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Prof. S.R. Bhide

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Dr. B.S. Umre

[5].The book titled "Laboratory manual for Electrical Machines –" with co-author Dr. D. P. Kothari, retired Professor & in charge Director, IIT Delhi, published by IK International Publishing House Pvt. Ltd., New Delhi.

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GUEST EDITOR FOR:

[1].**International Journal of Engineering, Science and Technology:**

Special issue on *"Applied Power Electronics and Intelligent Motion Control"*, Vol. 2, No.10, 2010, ISSN 2141-2820.

[2]. **Editorial Committee Member for:**

ASIAN POWER ELECTRONICS JOURNAL, HK PolyU, ISSN 1995- 051, HONGKONG**.**

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PATENTS (Applied)

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[2].”**Modular circuit for realizing any order of fractional differ-integrals**’ 344/MUM/2010
[3].”**Analogue emulator for DC motor with integral and fractional order PID**” 334/MUM/2010
[4].”**Design algorithm for the fractional order differ integrals**” 2778/MUM/2010.

Annexure V

Interaction with outside world:

Faculty interaction with outside world					
S.No	**Name of Faculty**	**Activity**	**Topic**	**Organization/Place**	**Duration**
1	**Prof. H. M. Suryawanshi**	Expert lecturer	Soft switching convertors	IISc Bangalore	10-Feb-12
		Expert lecturer	Resonant convertors & design of controller	MANIT,Bhopal	1-Nov-12
		Expert lecturer	Design of convertors	NIT Rourkela	1-Mar-13
		Expert lecturer	Resonant convertors	IISc Bangalore	26-May-13
		Expert lecturer	High step up convertors	IISc Bangalore	27-May-13
		Expert lecturer	Soft swtiching convertors	IISc Bangalore	28-May-13
		Expert lecturer	Different Design step for convertor	IISc Bangalore	29-May-13
		Expert lecturer	How to write research paper	IISc Bangalore	30-May-13
		Expert lecturer	Design of high efficient convertors	DTU,New Delhi	12-Dec-14
		Expert lecturer	Design of New materials for convertor	RV College of Engg. Bangalore	25-Jun-14
		Expert lecturer	Design of high efficient convertors	NIRMA Institute. Ahmedabad	26-Jun-15
2	**Prof. M. V. Aware**	Expert	Interview	G.H RAISONI, Nagpur	21-May-11
		Expert lecturer	Electrical Engg	AIT,Bangkok	26-Sep-11

		Expert	Interview	Pallotti College of Engg,Nagpur	26-May-11
		Expert	Faculty interview	NITW	14-Feb-12
		Expert lecturer	Electrical Engg	Dept of University, Pretoria, South Africa	2013
		Examiner	M E BY Research	G.H RAISONI, Nagpur	13-Apr-12
		Expert lecturer	Electrical Engg	Department TUI, Munich	05-Sep-15
3	**Dr. S. R Bhide**	Expert lecturer	Swtichgear and Protection System	NPTI/PGDC Nagpur	26-Aug-10
		Expert lecturer	Power Electronics & it's Applications	Dr. Babasaheb Ambedkar College of Engg. Nagpur	23-27-Apr-12
		Expert lecturer	Lecturer on MATLAB	Dr. Babasaheb Ambedkar College of Engg. Nagpur	9-Mar-13
		Expert lecturer	Popular Science Lecturer	RAMAN Science Centre, Nagpur.	11-May-13
4	**Dr. B. S. Umre**	Guest Lecture	Research Methodologies & Mathematical Modelling in Engg. & Tech.	Cummins College of Engg. For Women	13-Mar-10
		Guest Lecture	Emerging Technologies in P.E. Drives & P.S.	RUNGTA College of Engineering & Technology	30-Dec-11
		Observer	Joint Entrance Exam (Main)	CBSE	5-Oct-12
		Observer	Member of RTMNU first Affiliation Committee.	Nagpur Institute of Tech.	30-Oct-12
		Observer	JEE (Main) Exam	CBSE	7-Apr-13
		Expert for Audit	Thery Course End Semester Examination	YCCE	30-Jul-13
		Expert Lecture	Synchronous Impedances of Sysnchronous Machine M/C	Dr. Babasaheb Ambedkar College of Engineering & Research	17-Aug-13
		As Committee Member	Research Monitoring Committee towards Registration of Ph.D	Rajiv Gandhi College of Engg. Research & Technology Chandrapur.	18-Jan-14

		Monitoring	Final Year Project Session 2013-14	Dr. Babasaheb Ambedkar College of Engineering & Research	7-Apr-14
		Guest Lecture	Guiding Students	G.P. Raisoni College of Engg.	2-Aug-14
		Mentor	Final Year Project	Dr. Babasaheb Ambedkar College of Engineering & Research	30-Aug-14
		Expert Lecture	Synchronous Motor	Dr. Babasaheb Ambedkar College of Engineering & Research.	13-Sep-14
		Expert	Research Scholar	Shri Ramdeobaba College of Engg. & Management.	27-Sep-14
		Guest Lecture	Selection of Executive Engineers	Institute of Banking Personnel Selection.	30-Jan-15
		Expert	Pre-Submission Seminar	Dr. Babasaheb Ambedkar College of Engineering & Research.	26-Mar-15
		Guest Lecture	Oscillation in High Voltage turbo Machine	Tulsiramji Gaikwad-Patil College of Engg& Tech.	5-Aug-15
5	**Dr.V. B. Borghate**	Guest Lecture	Measurements & Instrumentation	NPTI/PGDC Nagpur	25-Aug-10
		Guest Lecture	Electromagnetism	NPTI/PGDC Nagpur	26-Aug-10
6	**Dr. (Mrs.)M. A. Chaudhari**	Guest lecture	Power Electronics Circuit Simulation	Dr. Babasaheb Ambedkar College of Engg. Nagpur.	23-27-Apr-12
		Resource person	Staff Development Program on, "An approach towards Research in Electrical Engineering and Power Electronics"	SSBT's COE Bambheri, Jalgaon	19th Oct. 2011
		Chief guest and Resource person	Engineers Day Program Topic "Working Principle and applications of UPS".	SDM Polytechnic, Nagpur	15-Sept-2011
		Guest lecture	Soft Switching Technique	Dr. Babasaheb Ambedkar College of Engg. Nagpur.	23-27- Apr-12
		Expert lecture	Processor Applications to Power System	G.H.Raisoni Engg. & Tech. for Women.	29-Oct-13
		Expert lecture	Scope of Research in EE	ABHA Gaikwad Patil College of Engg.	10-Dec-13

		Guest lecture	Processor Based control of dc motor drive	Dr. Babasaheb Ambedkar College of Engg. Nagpur	12-Mar-14
		Guest lecture	Power Electronics and Applications	G.H.Raisoni Engg. & Tech. Nagpur	20-Mar-14
		Examiner	UGC Interview	G.H. Raisoni Engg. & Tech. for Women	17-Jun-14
		Selection committee	Appointment of Professor in EE department	ITM-College of Engg.	4-Aug-13
		Chair Person	International conference on Electrical and Electronics Engineering	(ICEEE-2012), organized by IRNET, Bhubaneswar at Nagpur,	20th May 2012.
		Resource person	Staff Development Program on, "An approach towards Research in Electrical Engineering and Power Electronics"	Shivajirao Jondhale College of Engineering, Mumbai.	on 26th May. 2011, at
		Guest lecture	Research areas in Electrical Engineering	faculty of Electrical Engineering Dept., PCE, Nagpur	09/06/2015
		Guest lecture	Power Electronics and its applications	RGCOE Nagpur	13/03/2015
		Guest lecture	Introduction to FACTS	KDK college of Engineering Nagpur	4/9/2015.
		Chief Guest guest lecture	Engineers Day event and judge for project competition. "Uninterruptable power supply"	SDMP Nagpur	16/9/2015.
		Guest lecture	DC-DC converter	YCCE Nagpur	06/10/2015.
7	**Dr. P. S. Kulkarni**	Workshop	National Mission on Education through ICT by MHRD	Indian Institute of Technology Bombay	11-15-Apr-11
		To Deliver Expert Lecuture	Electro Magnetics	NIT, Uttarakhand	12-16-Mar-12
		To Work as Subject Expert	To Conduct Interviews in Electrical Engineering Dept.	Datta Meghe Institute of Engg. Wardha	28-May-13
		To Work as Expert	For Selection of Various Teaching Posts in Electrical Dept	G.H. Raisoni College of Engg.	10-Dec-13

7	**Dr. P. S. Kulkarni**	To Work as Expert	Board of Studies of Electrical Engg.	Shri. Ramdeobaba College of Engg. & Management	21-Jan-14
		To Work as Expert	UGC Interview in Electrical Department	G.H. Raisoni Institute of Engg. & Tech for Women	17-Jun-14
		To Work as Expert	For Six Monthly Progress of Ph. D Candidates	G.H. Raisoni College of Engg.	28-Jul-14
		Reviewing the UG Projects	For Electrical Engineering	Datta Meghe Institute of Engg. Wardha	17-Jan-15
		To Work as Expert	For Check the Correctness of Question & Answers given by NADP for Diploma level Recruitment	Indian Ordanance Factories, Nagpur.	7-Dec-14
		To Work as Expert	Selection of Executive Engg. In MAHAGENCO	IBPS Mumbai	28-Feb-15
		To Work as Expert	Selection of Candidates for Teaching Positions.	Guru Nanak Institute of Engg. & Management	25-Apr-15
		To Work as Expert	Selection of Candidates for Teaching Positions.	Guru Nanak Institute of Engg. & Tech.	25-Apr-15
		To Work as Expert	Evaluation of Ph. D Electrical Engg. Thesis	Government College of Engg., Aurangabad	28-May-15
		To Work as Expert	Appointment as External Examiner for Dissertation Examination M.E. (EPS) Electrical Power Systems	Government College of Engg., Amaravti	10-Jul-15
		To Work as Reviewer	Manuscript, Entitled "MPPT" for International Journal of Research in Engg. & Science	Meghe Group of Institution, Nagpur.	2-Jul-15
8	**Dr. M. R. Ramteke**	Speaker	Research Paper Publications	Dr. Babasaheb Ambedkar College of Engineering & Research	7-Dec-12
		Expert Lecture	Electrical Machine	NIT, Uttarakhand	28-Jan to 1-Feb-13
		Expert Lecture	Advanced Power Electronics	G.H. Raisoni Institute of Engg. & Tech. for Women	19-Oct-13
		Examiner	External Examiner for Dissertation for M.Tech.	Government College of Engg. Amravati	4-Jul-14

8	**Dr. M. R. Ramteke**	Attended	Power Electronics Applications for Renewable Integration	Indian Institute of Technology Kanpur	30-Mar to 1 Apr-15
		Guest Lecture	Resonant Convertor	Yeshwantrao Chavan College of Engg. Nagpur	26-Mar-15
		Attended	Study Committee	Gondawana University, Gadhchiroli.	11-Aug-15
		Guidance	Final Year Project	Rajiv Gandhi College of Engg.	22-Aug-15
9	**Dr. S. S. Bhat**	Guest Lecture	MATLAB Applications in EE	Yeshwantrao Chavan College of Engg. Nagpur	29-30 Oct 13
		Guest Lecture	MATLAB Applications in High Voltage	Tulsiramji Gaikwad-Patil College of Engg& Tech.	1-Aug-15
10	**Dr. (Mrs.) A. S. Junghare**	Expert faculty	Faculty Development Program, 'Effective Teaching through curriculum innovation'	K.K.Wagh Institute of Engineering Education and Research, Nashik	8-9 June 2009
		Expert faculty	STTP Recent Trends in Power System,	Visvesvaraya National Institute of Technology, Nagpur, Electrical Engg Dept	27th July-1st Aug2009
		Expert faculty	FDP, ' Research Methodology- Mathematical Modeling and Teaching Learning Process	MIT College of Engineering Pune	14-15 Oct 2010
		Expert faculty	One Week ISTE-STTP on 'Research Methodology'	Shivajirao Jondhale College of Engineering, Thane. Mumbai	19-23 July 2011
			Expert faculty in Faculty Development Program	NIT Uttarakhand	21-29 April 2012
			Expert faculty in Faculty Development Program	NIT Uttarakhand	18-26 Aug 2012
			Expert on Review Committee for External Evaluation of an Autonomous College Govt. College of Engineering	Govt. College of Engineering, Amravati	25 Oct 2012
			Expert faculty in Two Day workshop on 'Simulation using MATLAB'	Bapuraoji Deshmukh College of Engineering, Sewagram, Wardha	19-20 January 2013
			Expert on interview panel for recruitment	NIT Uttarakhand	23 Feb 2013
			Expert faculty in	NIT Uttarakhand	14-20 April

			Faculty Development Program		2013
			Expert on interview panel for recruitment	NIT Uttarakhand	14-17 Oct. 2014
			National Workshop on Wide area Monitoring and Control of Power Systems using Synchrophasor Technology	IIT, Kanpur	13-14 April 2012
			Residential Training Program,' The Sexual Harassment of Women at Workplace Act, 2013'	Institute of Public Administration, Bangalore	2-3 Sept. 2013
			Signals and ystems	IIT Kharagpur	2-12 Jan 2014
			Dynamics and Controls in State Space	IIT Mumbai	19-23 May 2014
			Faculty Development Program	IIM Raipur	13-18 July 2015
			CONCLAVE ON ACADEMIC REFORMS	National Institute of Technology, Tiruchirappalli	28th and 29thApril, 2015
11	**Dr. V. S. Kale**	Expert Lecture	Circuit Breaker and its Designing	Guru Nanak Institute of Engg. & Tech.	2-Mar-15
		Expert Lecture	Circuit Breaker	G.H. Raisoni College of Engg.	12-Mar-15
		Expert Lecture	Fuzzy Logic ANN & use for Matlab Toolboxes for their applications in Electrical Engg.	Shri. Ramdeobaba College of Engg. & Management	22-23-Oct-13
		Expert Lecture	GA Application in Electrical Engg.	Yeshwantrao Chavan College of Engg.	22-Apr-13 3-May-13
		Chief Guest	Workshop on PLC & SCADA	ITM College of Engg.	17-18-Jan-14
		Guest Lecture	Wavelet Analysis	Yeshwantrao Chavan College of Engg.	8-Oct-12
		Session	Industrial Automation & Computing.	Jhulelal Institute of Tech.	12-13-Apr-14
		Session	Green Power & Energy A Step Towards Better Future.	G.H. Raisoni College of Engg.	27-Sep-13
		Guest Lecture	Wavelet Applications in Power System Protection.	Yeshwantrao Chavan College of Engg.	26-Sep-13
		Guest Lecture	Wavelet Applications in Power System.	Yeshwantrao Chavan College of Engg.	22-Sep-13

12	**Dr. (Mrs.) N. R. Patne**	Expert Lecture	Role of Power Factor improvement	Shri Datta Meghe Polytechnic	26-Sep-09
		Expert Lecture	Harmonics in Power System	Shri Datta Meghe Polytechnic	27-Feb-12
		Expert Lecture	Harmonics in Power System	Shri Datta Meghe Polytechnic	16-Feb-13
		Expert	To enhance quality of E-learning Material	Shri Datta Meghe Polytechnic	18-Feb-15
14	**Dr. M. S. Ballal**	Guest Lecture	Transformer Protection	College of Engg, Aurangabad	23-Nov-12
		Guest Lecture	AI & its applications in Transmission line Protection	G.H. Raisoni Engg. & Tech. PUNE	18-Nov-13
		Expert Lecture	HVDC	G.H. Raisoni Engg. & Tech. PUNE	14-Mar-14
		Expert Lecture	Earthing& Distribution system	G.H. Raisoni Engg. & Tech. PUNE	15-Mar-14
		Expert Lecture	Condition Monitoring of Electrical Machines	College of Engg, PUNE	31-Oct-14
		Expert Lecture	Power System Dynamics & HVDC	G.H. Raisoni Engg. & Tech. PUNE	25-May-15
		Expert	Mtech Dissertation evaluation	College of Engg, PUNE	9-Jul-15
15	**Dr. M. M. Lokhande**	Expert Lecture	Recent trends in Electrical Power System	NIRMA UNIVERSITY, Ahmedabad	21-May-12
		Expert Lecture	Energy Management in Electrical Systems	School of Technology, Gandhinagar	16-May-14
16	**Dr. R. Kr. Kesari**	Expert Lecture	Global Clinic Programme	Harvey Mudd College, Claremont, California	14-May-10
		Guest Lecture	Permanent Magnet Brushless DC Motor Drive for Electric Vehicle Propulsion	Birla Institute of Tech. Mesra, Ranchi	18-Aug-12
		Guest Lecture	Permanent Magnet Brushless DC Motor Drive for Electric Vehicle Propulsion	Birla Institute of Tech. Mesra, Ranchi	23-Aug-12
		Guest Lecture	Permanent Magnet Brushless DC Motor Drive	NIT Rourkela	4 to 6-Apr-14