NATIONAL BOARD OF ACCREDITATION

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

COMPUTER SCIENCE

NATIONAL BOARD OF ACCREDITATION

4th Floor East Tower, NBCC Place
Bhisham Pitamah Marg, Pragati Vihar
New Delhi 110003
P :91(11)24360620-22, 24360654
Fax: 91(11)24360682

(January, 2013)

Contents

Self Assessment Report (SAR) UG

Part A

I. Institutional Information

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

VISVESVARAYA NATIONAL INSTITUTE OF TECHNOLOGY(VNIT),

SOUTH AMBAZARI ROAD, NAGPUR 440010

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

Dr. Narendra S. Chaudhari, Director VNIT.

Ph :

Email : director@vnit.ac.in

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

Ph : 0712-2801345

Email : kdkulat@ece.vnit.ac.in / kishor_kulat@yahoo.com

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

1.3.1 Historical Background

The VNIT, Nagpur is one of the thirty National Institutes of Technology in the country. The Central Government by Act of Parliament (National Institutes of Technology Act, 2007 (29 of 2007)) declared VNIT Nagpur as an Institute of National Importance. The Act was brought into force from 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,[5]

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.[9][10][11] 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"[13][14] as it connects many tiger reserves in India to the world. It is among the important cities for the Information Technology Sector in Maharashtra. Nagpur lies at the dead center of the country with the Zero Mile marker indicating the geographical center of India. City of Nagpur is considered as geographic centre of India

with its famous Zero Mile stone. Major   National highways and rail networks connecting Delhi with Hyderabad/ Bangalore/ Kanyakumari and Mumbai with Kolkata pass through the city. It is now

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

Institute has 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	1956	92
04.	Computer Science Engg.	1987	92
05.	Electronics and Communication Engineering	1980	92
06.	Electrical And Electronics	1960	92
07.	Mechanical Engineering	1960	92
08.	Metal and Materials Engineering	1960	92
09.	Mining Engineering	1982	32
	TOTAL		**738**
	Post Graduate & Research Programs : **M. Tech.**		
01.	Environmental Engineering	1966	20
02.	Water Resources Engineering	2011	20
03,	Construction Technology	2010	20
04.	Transportation Engineering	2011	20
05.	VLSI Design	2007	20
06.	Communication System Engineering	2012	20
07.	Computer Science Engineering	2007	20

08.	Industrial Engineering	1989	20
09.	Heat Power Engineering	2002	20
10.	CAD-CAM	2010	20
11.	Integrated Power System	1968	20
12.	Power Electronics & Drives	2010	20+5 SP
13.	Material Engineering	1960	20
14.	Structural Dynamics and Earthquake Engineering	2003	20
15.	Structural Engineering	1991	20
16.	Excavation Engineering	2012	20
17.	Urban Planning	1988	20
	TOTAL		**320**
	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 of validity w.e.f. 10.02.2009
01.	B.Tech. Electronics & Comm. Engg.	Accredited	3 Years
02.	B.Tech. Mechanical Engg.	Accredited	3 Years
03.	B.Tech. Civil Engg.	Accredited	3 Years
04.	B.Tech. Computer Science & Engg.	Accredited	3 Years
05.	B.Tech. Mining Engg.	Accredited	5 Years
06.	B.Tech. Metallurgical & Materials 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. Ferrous Process Metallurgy	WITHDRAWN	
15.	M.Tech. Ferrous Process Metallurgy	WITHDRAWN	

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
	Total Increased Intake	**60**

Campus

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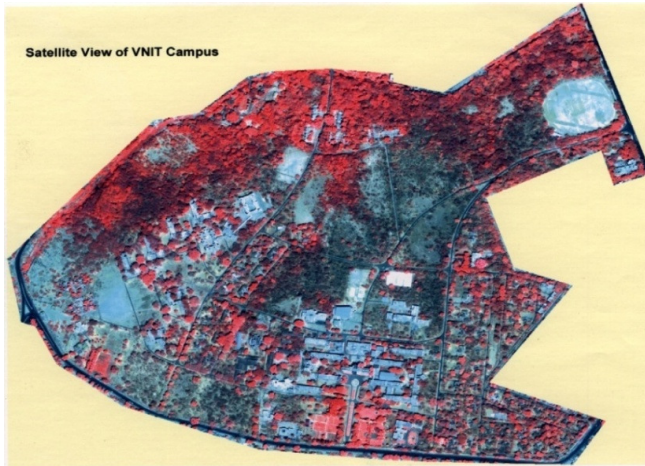
VNIT Campus is spread over an area of 214 acres near Ambazari lake. It presents a panorama of harmony in architecture and natural beauty. The campus has been organized in three functional sectors;

- Hostels for students, Health centre, sports complex

- Academic Buildings, Administrative Building, and Library
- Residential Sector for family & staff

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

The Institute has its own fully fledged Health Center with a full time residential Medical Officer. The specialized medical services of a Psychological Counsellor, Dietician, Physiotherapist, Pathology lab, Yoga centre, and also medical consultants in Ayurveda and Homeopathy are available. Patients suffering from serious illness/ equiring 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 (27 of 2007)

1.5. Mission and Vision of the Institution:

Mission

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

Vision

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

I.6. Organisational Structure:

1.6.1 Administration

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

Apart from the above statutory committees, the Board has the power to constitute various sub-committees for smooth and efficient administration. Thus, the Board has constituted the Stores

Purchase Committee (SPC), Grievance Committee (GC), and Special Cell. The SPC administers the centralized procurement of equipment and material whereas the GC provides a platform to hear the views of staff and faculty on grievances. The Special Cell functions to protect the interest of backward-class candidates through procedural, institutional, and other safeguards.

1.6.2 Flow Chart showing Institutional Administration

Figure - 1

NIT Standing Committee --------- NIT COUNCIL

Chairman Board of Governors

Director

Deputy Director

Chair Person
- Grievance Committee
- Store Purchase Committee

Faculty In-charges (FIC)
- Distance Edu. Programme
- Water Coolers & ACs' maintenance
- Training & Placement
- Guest House
- Electrical Maintenance
- Telephone & EPABX
- New Constructions
- Network & Decision Support System
- Information Technology & Communication
- Education Technology & Library Science

Deans
- Planning & Development
- Faculty Welfare
- Research & Consultancy
- Academics
- Students Welfare

Executive Engineer (Estate Maintenance)

Deputy Registrar (Accounts)
- Asst. Registrar (Internal Audit)
- Asst. Registrar (Accounts)

Dy Registrar Estt. & Admn
- Asst. Registrar (Estt & Admn.)

Deputy Registrar (Academic)
- Asst. Registrar (Exams)
- Asst. Registrar (Students Affairs)
- Asst. Registrar (Hostel)

Registrar
- Asst. Registrar Stores
- Medical Officer (Health Centre)
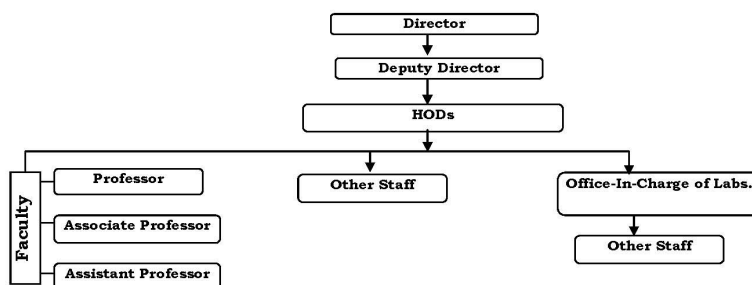- Security Officer

HoDs
- Chief Warden
- Warden

11

1.6.3 Flow Chart showing the hierarchy of Academic Departments

Figure - 2

1. ACADEMIC DEPARTMENTS

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

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

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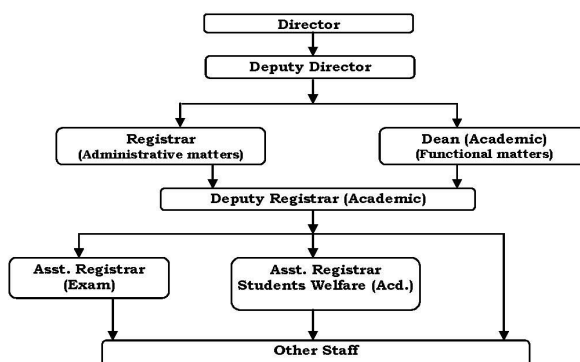
	Reporting Officer	Reviewing Officer
Group – A	Registrar *	Deputy Director /Director
Group – C/Other Staff	Section Head	Registrar

* In consultation with Dean (Academic)

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

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

CFI (Centrally funded institution)

I.8. Nature of the trust/society:

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

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

Name of the Institution	Year of establishment	Location
NA	-	-

1.9. External sources of funds:

(Rs. in Lacs)

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

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

* No funds under plan were received.

I.10 Internally acquired funds:

(In Rupees)

Name of the Internall Source	CFY	CFYm1 2010-11	CFYm2 2011-12	CFYm3 2012-13
Students' fee	2,70,14,268	8,62,01,169	100,32,5,522	17,79,67,064

Interest & Other Income	4,88,21,680	8,16,88,699	5,63,25,522	3,23,85,087

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

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

VNIT Nagpur is making available to 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	CFYm1	CFYm2	CFYm3
Category				
Scholarship Assistance	Various sources given in **I.11**			
Amount	3,28,05,922	1,74,86,164	1,77,64,254	2,37,27,156

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

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

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

I.13 Total number of engineering students:

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

Total number of other students, if any

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

I.14 Total number of employees:

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

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

A. Regular Staff

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

B. Contract Staff

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

End of Part A I Institutional Information

II. Departmental Information

11.1   Name and address of the department :

Department of Computer Science & Engineering , VNIT, Nagpur

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

Dr. P. S. Deshpande , Associate Professor & Head of the Department,

Ph. No. 0712-2801322/ 2801029, psdeshpande@cse.vnit.ac.in

13.1   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
B.Tech. in Computer Science & Engineering	Started with 30 seats in 1987 Intake increases to 60 in 2006 Intake increases to 71 in 2008 Intake increases to 81 in 2009 Intake increases to 92 in 2010
M.Tech. in Computer Science & Engineering	Started with 13 seats in 2007 Intake increases to 16 in 2008 Intake increases to 18 in 2009 Intake increases to 20 in 2010

14.1   Mission and Vision of the Department

(The department is required to specify its Mission and Vision).

Vision of the Department

To contribute effectively to the important national endeavour to produce quality human resource in the information technology and related areas for sustainable development of the country's IT industry needs.

To advance the state of the art in computer science and engineering by working on cutting edge research topics, publishing quality research papers and filing enduring patents.

To serve the local and the national community by creating awareness about IT related products and to impress upon then the importance of knowledge management.

Mission of the Department

To produce highly qualified and motivated graduates through a rigourous curriculum of theory and application that develops the ability to solve problems, individually and in teams.

Creating knowledge of fundamental principles and innovative technologies through research within the core areas of computer science and also in inter-disciplinary topics.

Serving the communities to which we belong at local and national levels, combined with a deep awareness of our ethical responsibilities to our profession and to society.

15.1 List of the programmes/departments which share human resources and/or the facilities of this department/ programmes(in %):
(Instruction: The institution needs to mention the different programmes which share the human resources and facilities with this department/programme being accrediated)

Sr. No.	Name of Program	Load	Load in %
01	Electronics & Telecommunication	2 Theories for UG	35%
02	First Year	10 Theories + PR	
03	M.Sc. (Maths, Physics, Chemistry)	01 Theory + PR	

11.6 Total number of students

UG: 92

PG: 20

11.7 Minimum and Maximum number of staff on roll during the current and three previous academic years (1st July to 30th June) in the department:

Item	CAY		CAYm1		CAYm2		CAYm3	
	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.
Teaching Staff in the department	13	13	13	13	13	13	13	13
Non-teaching Staff	7	7	7	7	7	7	7	7
Total								

11.7.1 Summary of budget for the CFY and the actual expenditure incurred in the CFYm1,
CFYm2, CFYm3(for the department):

Item	Budgeted in CFY	Actual expenses in CFY (till ....) *	Budgeted in CFYm1	Actual Expenses in CFYm1	Budgeted in CFYm2	Actual Expenses in CFYm2	Actual Expenses in CFYm3	Budgeted in CFYm3
Laboratory equipment	4500000	556534		2975864				
Software				900000				
Laboratory consumables								
Maintenance and spares				26868				
Training and Travel								
Miscellaneous expenses for academic activities	1050000	173534		600736				
Non-plan		30164		135317				
Total	**5550000**	**760232**	**3000000**	**4638785**				

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

III Programme Specific information

III.1   Name of the Programme

P.G. in   Computer Science & Engineering

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

III.2   Title of the Degree : **M.Tech. Computer Science & Engineering**

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

III.3   Name, designation, telephone number, and e-mail address of the programme coordinator for the NBA:

Dr. P. S. Deshpande , Associate Professor & Head of the Department,

Ph. No. 0712-2801322/ 2801029, psdeshpande@cse.vnit.ac.in

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

Programme	Description
M.Tech. Computer Science & Engineering	Started with 13 seats in 2007 Intake increases to 16 in 2008 Intake increases to 18 in 2009 Intake increases to 20 in 2010

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

III.6   Total number of students in the programme: 25

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

Item	CAY		CAYm1		CAYm2		CAYm3	
	Min.	Max.	Min.	Max.	Min.	Max.	Min	Max.
Teaching Staff with the program	13	13	13	13	13	13	13	13
Non-teaching Staff	7	7	7	7	7	7	7	7

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

Item	Budgeted in CFY	Actual expenses in CFY (till)*	Budgeted in CFYm1	Actual Expenses in CFYm1	Budgeted in CFYm2	Actual Expenses in CFYm2	Actual Expenses in CFYm3	Budgeted in CFYm3
Laboratory equipment	4500000	556534		2975864				
Software				900000				
Laboratory consumables								
Maintenance and spares				26868				
Travel								
Miscellaneous expenses for academic activities	1050000	173534		600736				
		30164		135317				
Total	**5550000**	**760232**	**3000000**	**4638785**				

PART B

1.Vision , Mission and Programme Educational Objectives (75)

1.1 Vision and Mission (5)

1.1.1 State the Vision and Mission of he institute and department (1)
(List and articulate the Vision and Mission statement of the institute and department)

Vision of the Institute

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 propogate innovative technologies for the economic development of the Nation.

Mission of the Institute

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 of the Department

To contribute effectively to the important national endeavour to produce quality human resource in the information technology and related areas for sustainable development of the country's IT industry needs.

To advance the state of the art in computer science and engineering by working on cutting edge research topics, publishing quality research papers and filing enduring patents.

To serve the local and the national community by creating awareness about IT related products and to impress upon then the importance of knowledge management.

Mission of the Department

To produce highly qualified and motivated graduates through a rigourous curriculum of theory and application that develops the ability to solve problems, individually and in teams.

Creating knowledge of fundamental principles and innovative technologies through research within the core areas of computer science and also in inter-disciplinary topics.

Serving the communities to which we belong at local and national levels, combined with a deep awareness of our ethical responsibilities to our profession and to society.

1.1.2 Indicate how and where the Vision and Mission are published and disseminated (2)
(Describe in which media (e.g. websites, curricula books)the Vision and Mission are published and how these are disseminated among stakeholders)

The vision and mission statements of the departments are published on the department website.

1.1.3 Mention the process for defining Vision and Mission of the department(2)
(Articulate the process involved in defining the Vision and Mission in the department from the Vision and Mission)

The Head of the Department is responsible in leading a discussion about the department Vision and Mission statements. In several departmental meetings, the basic ethos of the Vision and Mission statements of the institute were discussed in detail. Accordingly, an executive committee was formed in the department to prepare the departmental Vision and Mission statements by specifically considering the computer science and engineering aspects. The executive committee prepared draft Vision and Mission statements which were discussed and brainstormed in a meeting consisting of the entire faculty. The statements were then finalised.

1.2 Programme Educational Objectives (10)

1.2.1 Describe the Programme Educational Objectives (PEOs)(1)
(List and articulate educational objectives of the programme under accreditation)

1. Gain the ability to analyze and solve computer science and engineering problems through application of fundamental knowledge of mathematicsand algorithms.

2. Learn to apply modern skills, techniques, and engineering tools to create computational systems.Understand the state of the art in the recent areas of research in computer science and engineering and to formulate problems from them and perform original work to contribute in the advancement of the state of the art.

3. To be able to adapt to the evolving technical challenges and changing career opportunities. Learn to effectively communicate ideas in oral, written, or graphical form and to promote collaboration with other members of engineering teams.

1.2.2 State how and where the PEOs are published and disseminated (1)

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

The PEOs are published on the departmental website and are discussed in various meetings with the students in the class committees.

1.2.3 List the stakeholders of the programme(1)
(List stakeholders of the programme under consideration for accreditation and articulate their relevance)

Students, parents, employers from the IT industry, alumni, and faculty are the stakeholders of the programme.

1.2.4 State the process for establishing the PEOs(3)
(Describe the process that periodically documents and demonstrates that the PEOs anr based on the needs of the programme's various stakeholders)

The Head of the Department is responsible in leading a discussion about the PEOs. An executive committee was formed in the department to prepare the PEOs. The executive committee prepared draft PEOs which were discussed and brainstormed in several meetings involving the entire faculty. The mapping of the PEOs to the different courses taught by the faculty was discussed in these meetings. The PEOs were refined during the course of the discussions.

Externally, the PEOs are discussed time to time with colleagues from the industry who visit the department on various ocassions – e.g. to deliver expert lectures, to interact regarding industrial consultancy projects with the faculty, to conduct student campus placement interviews, to conduct tests and interviews for internships for the students etc. The views of the department are explained and their suggestions and guidance is sought. Similar activity is carried out with colleagues from the academia who visit the department on various ocassions – e.g. to deliver expert lectures, to attend conferences, to conduct viva-voce examinations, etc. Moreover, whenever the alumni of the department who are either working in the industry or are undergoing higher studies in the country or abroad visit the department, the departmental objectives, the courses and the vision of the department is discussed with them. Their opinion is also taken into consideration for refining the objectives.

Periodically, meetings are conducted with the current students and sometimes with their parents. The objectives of the department are explained to them. Their feedback is sought in order to improve the students' learning as well as to refine the objectives.

1.2.5 Establish consistency of the PEs with the Mission of the institute (4)
(Describe how the Programme Educational Objectives are consistent with the Mission of the department)

PEO 1 is consistent with the first Mission statement of to achieve high standards of excellence in propogating engineering knowledge and to provide education with rigourous academics. PEO 2 is consistent with the Mission statement of generating new knowledge and enjoy the

knowledge discovery process. The PEO 3 is consistent with the Mission statement of having dialogue with the society and to identify and solve different problems at the local and national level.

1.3 Achievement of Programme Educational Objectives (20)

1.3.1 Justify the academic factors involved in achievement of the PEOs (10)
(Describe the broad curricular components that contribute towards the achievement of the Programme Educational Objectives)

1. Different core courses are present in the scheme of M. Tech. in Computer Science and Engineering with which a student is able to apply the knowledge gained in problem solving e.g. Advanced Computer Architecture, Distributed Systems, Advances in Compiler Construction etc.
2. In the course assignments and the associated laboratory work, the students are encouraged to consider real-world problems and think about their solutions using different techniques implemented using convenient programming languages. In addition to these, there are two software labs as core courses in which the students are made aware of new and open-source technologies and tools. The students prepare feasible projects using these.
3. In addition to the core courses, there are elective courses, in which a student is introduced to many new topics and the current research work going on in the topics – e.g. Pattern Recognition, Real-Time Systems, etc.
4. The courses and their syllabi are discussed at length for their revision and upgradation in departmental faculty meetings. The recommendations of the deparmental meetings are then discussed in the meetings of the Board of Studies which has two external members – one a faculty from an IIT and another a senior preson from the industry. With inputs from everybody, the curriculum is updated from time to time so that the students are exposed to the changing technology scenario and are able to adapt to the changes.
5. All the students need to undergo a year long project, which is done individually. In that, the students work on a research problem and understand the issues and the current work going on in that. The faculty and the student together formulate a problem. The possible techniques that can be used for solving the problem are then implemented and the performances of the solutions are then evaluated.
6. Many times during the courses and the laboratories, the students are required to submit a report and make a formal presentation on a specific topic. As a part of the project, the students are required to make two presentations – one at the end of the third semester and one in front of the external examiner. Towards the end of the project, the students are required to write a thesis detailing the technique and the performance evaluation that they have carried out. They are also then required to make a formal presentation of their project. This helps them in developing both the written and oral presentation skills.

1.3.2 Explain how the administrative system helps in ensuring the achievement of the PEOs(10)
(Describe committees and their functions working process and related regulations)

1. At the lowest level there are class committees formed for students of both theyears. Every committee consists of four students of the respective class and a faculty member who does not teach that class. The students are advised to give a candid feedback

regarding the courses and the teaching methodology. These meetings are supposed to happen every month.

2. The faculty member of a class committee is supposed to convey the issues discussed in the meetings with the Head of the Department and also with other faculty members in a faculty meeting.
3. A deparmental meeting is then held after the first sessional and the second sessional examinations to incorporate any changes.
4. Periodically, the institute conducts senate meetings where the professsors of the department and the HOD represent the views of the department.
5. In addition to this, atleast two times a year, formal Board of Studies meetings are held in which there are external members. The PEOs are discussed at length in those meetings and feedback regarding those is incorporated.

1.4 Assessment of the achievement of the Programme Educational Objectives (35)

1.4.1 Indicate tools and processes used in assessment of the achievement of the PEOs(5)

Describe the assessment process that periodically documents and demonstrates the degree to which the Programme Educational Objectives are attained. Also include information on:

a) A listing and description of the assessment processes used to gather the data upon which the evaluation

of each programme educational objective is based. Examples of data collection processes may include, but are not limited to, employer surveys, graduate surveys, focus groups, industrial advisory committee

meetings, or other processes that are relevant and appropriate to the programme;

1. The PEOs are regularly discussed in the faculty meetings and are updated whenever necessary.
2. PEOs are also discussed in the Board of Studies meetings and any suggestions are incorporated.
3. A discussion also takes place in meetings with the colleagues from the industry and from academia regarding the updation of the PEOs.

We have put into place a system that will collect feedback in the form of questionnaire from the following

i.   Employers, who visit the institute for campus recruitment
ii.   The alumni, who attend the alumni meet which is held in the month of December every year
iii.   External visitors from the academia and the industry, who visit the department from time to time for presentations, viva-voce examinations, workshops, conferences, etc.

The feedback forms for all these are shown below.

Feedback Form for Employers

Feedback Form for the Department of Computer Science and Engineering

This feedback sheet consists of two parts.

In the first part, please provide a candid feedback regarding the students (the current students and the past students who might be working in your organization) of the Dept. of Computer Science and Engineering, VNIT, Nagpur on each of the following aspects. In the second part, please provide a feedback regarding the curriculum.

Pl. give a feedback in the range – 0(Not able to give a rating), 1(Fair), 2(Average), 3(Good), 4(Very Good), and 5 (Excellent).

Thanks in advance for the time taken to fill in this survey. Your feedback is very important for us to improve our curriculum and teaching methodology.

Part I - Feedback regarding the students

1. Fundamentals of Mathematics and Science of the students

2. Basics of Computer Science

3. Algorithm Design Techniques

4. Knowledge about recent tools and their usage

5. Practical skills

6. Ability to grasp new ideas

7. Ability to learn new skills

8. Willingess to Learn

9. Communication Skills

10. Working in a team

Part II - Feedback regarding the curriculum

1. Content and Coverage

2. Adequacy of the core coureses

3. Ordering of the courses

4. Adequacy of the elective courses

5. Practical content in the curriculum

In the rest of the sheet (you may use the reverse side as well), please feel free to add any additional information which you may want to share with us for the improvement of both the learning of the students and the curriculum.

<u>Feedback Form for Alumni</u>

<u>Feedback Form for the Department of Computer Science and Engineering</u>

This feedback sheet consists of two parts.

In the first part, please provide a candid feedback regarding the outcomes achieved by you while studying in the Dept. of Computer Science and Engineering, VNIT, Nagpur on each of the following aspects. In the second part, please provide a feedback regarding the curriculum.

Pl. give a feedback in the range – 0(Not able to give a rating), 1(Fair), 2(Average), 3(Good), 4(Very Good), and 5 (Excellent).

Thanks in advance for the time taken to fill in this survey. Your feedback is very important for us to improve our curriculum and teaching methodology.

<u>Part I - Feedback regarding the outcomes</u>

1. Fundamentals of Mathematics and Science of the students

2. Basics of Computer Science

3. Algorithm Design Techniques

4. Knowledge about recent tools and their usage

5. Practical skills

6. Ability to grasp new ideas

7. Ability to learn new skills

8. Willingess to Learn

9. Communication Skills

10. Working in a team

<u>Part II - Feedback regarding the curriculum</u>

1. Content and Coverage

2. Adequacy of the core coureses

3. Ordering of the courses

4. Adequacy of the elective courses

5. Practical content in the curriculum

In the rest of the sheet (you may use the reverse side as well), please feel free to add any additional information which you may want to share with us for the improvement of both the outcomes and the curriculum.

Feedback Form for External Visitors

Feedback Form for the Department of Computer Science and Engineering

This feedback sheet consists of two parts.

In the first part, please provide a candid feedback regarding the students of the Dept. of Computer Science and Engineering, VNIT, Nagpur on each of the following aspects. In the second part, please provide a feedback regarding the curriculum.

Pl. give a feedback in the range – 0(Not able to give a rating), 1(Fair), 2(Average), 3(Good), 4(Very Good), and 5 (Excellent).

Thanks in advance for the time taken to fill in this survey. Your feedback is very important for us to improve our curriculum and teaching methodology.

Part I - Feedback regarding the students

1. Fundamentals of Mathematics and Science of the students

2. Basics of Computer Science

3. Algorithm Design Techniques

4. Knowledge about recent tools and their usage

5. Practical skills

6. Ability to grasp new ideas

7. Ability to learn new skills

8. Willingess to Learn

9. Communication Skills

10. Working in a team

Part II - Feedback regarding the curriculum

1. Content and Coverage

2. Adequacy of the core coureses

3. Ordering of the courses

4. Adequacy of the elective courses

5. Practical content in the curriculum

In the rest of the sheet (you may use the reverse side as well), please feel free to add any additional information which you may want to share with us for the improvement of both the learning of the students and the curriculum.

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

The frequency of taking the feedback is mentioned above.

1.4.2. Provide the evidence for the achievement of the PEOs (30)
a) The expected level of attainment for each of the programme educational objectives;

We expect a high level of attainment by our students for each of the PEOs.

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

We would be able to analyze this after the analysis of the feedback forms once they are collected.

c) How the results are documented and maintained.

The feedback forms would be stored by the department for a period three years and the summary and the analysis would be stored permanently in the soft form by the department.

1.5 Indicate how the PEOs have been Redefined in the past (5)
(Articulate with rationale how the results of the evaluation of the PEOs have been used to review/ redefine the PEOs)

This is the first time that the PEOs have been defined. They will be analyzed at the end of every semester, and suitable modifications would be done as and when required.

2. Programme Outcomes (250)

2.1.Definition and Validation of Course Outcomes and Programme Outcomes (20)

2.1.1. List the Course Outcomes(COs) and Programme Outcomes (POs) (1)
(List the course outcomes of the courses in programme curriculum and programme outcomes of the programme under accreditation)

Programme Outcomes (POs)

1) To obtain sound knowledge in the theory, principles and applications of computer systems.
2) Apply knowledge of mathematicsand algorithms in the design and development of software systems.
3) Configure recent software tools, apply test conditions, and deploy and mange them on computer systems.
4) Perform experiments on different software packages either obtain from external parties or developed by themselves and analyse the experimental results.
5) Design and develop software projects given their specifications and within performance and cost constraints.
6) Identify, formulate and solve software engineering problems and understand the software project management principles.
7) Ability to understand the computing needs of inter-disciplinary scientific and engineering disciplines and design and develop algorithms and techniques for achieving these.
8) Acquire and understand new knowledge, use them to develop software products, and to understand the importance of lifelong learning.
9) Ability to extend the state of art in some of the areas of interest and create new knowledge.
10) Communicate effectively in oral, written and graphical form.
11) Understand and formulate research problems and explore the current research being done.
12) Extend the state of art and explore new problems and solution techniques.

2.1.2.State how and where the POs are published and disseminated (1)
(Describe in which media (e.g. websites, curricula books) the POs are published and how these are disseminated among stakeholders)

The POs are published on the department website and are discussed with students both formally in lectures and in informal discussions with them.

2.1.3.Indicate processes employed for defining the POs (3)
(Describe the process that periodically documents and demonstrates that the POs are defined in alignment with the graduate attributes prescribed by the NBA.)

The method used for defining the POs is the same as the one used in defining of the PEOs.

2.1.4.Indicate how the defined POs are aligned to Graduate Attributes prescribed by the NBA (7)

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

The following table indicates how the POs are aligned to the Graduate Attributes. The Graduate Attributes are written on the rows and the number of a PO is referred on each coloumn. A '*' mark on a cell indicates which POs are aligned with a particular Graduate Attribute of NBA.

Graduate Attributes	Program Objectives (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
Engineering Knowledge	*	*					*	*	*			
Problem Analysis	*	*		*	*	*	*		*			
Design/Development of Solutions		*			*	*	*		*			
Conduct Investigations			*	*					*			
Modern tool usage			*	*					*			
The Engineer and Society					*	*	*			*	*	*
Environment and Sustainability					*	*					*	
Ethics										*	*	*
Individual and team work					*					*	*	
Communication							*	*	*	*	*	*
Project Management and Finance					*	*	*					
Lifelong Learning							*		*			*

2.1.5. Establish the correlation between the POs and the PEOs (8)

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

The following table indicates how the correlation between the POs and the PEOs. The number of a PEOs is referred on a row and the number of a PO is referred on a coloumn. A 'H', 'M', or 'L' mark on a cell indicates whether a PO in a coloumn has 'high', 'medium', or 'low' correlation with the corresponding PEO on the row. A blank cell inidicates that there is no correlation bewtween a particular PO and the PEO.

Program Educational Objectives (PEOs)	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
1	H	H	L	L	M	M	H	L	M			
2	M	M	H	H	H	H	M	H	H	M	M	M
3	L					M	L			H	H	H

2.2. Attainment of Programme Outcomes (75)

2.2.1. Illustrate how the course outcomes contribute to the POs (5)

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

In this sub-section, we describe in detail the courses, the course contents, the pre-requisites, the evaluation methods, books/references, and the course outcomes. This is done for every course defined in the curriculum.

Programm Curriculum

Course Code	Course title	Total number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical #(P)	Total Hours	
....	....					
CSL 522	Advances in Compiler Construction	3	0	2	5	8
CSL 517	Pattern Recognition (Elective)	3	0	2	5	8
CSL 523	Advanced Computer Architecture	3	0	0	3	6
CSL 514	Advances in Algorithms	3	0	0	3	6
CSP 520	Software Lab- I	0	0	2	2	2
CSL 528	Cryptography and Information Security	3	0	0	3	6
CSL 519	Distributed Systems	3	0	2	5	8
CSL 520	Distributed and Prallel Databases	3	0	2	5	8
CSP 529	Technical Writing and Publishing	0	0	2	2	2
CSP 531	Software Lab – II	0	0	2	2	2
CSL 516	Soft Computing Techniques (Elective)	3	0	0	3	6
CSL 521	Software Architecture (Elective)	3	0	0	3	6
CSL 436	Information Retrieval (Elective)	3	0	0	3	6
CSL 530	Topics in Bioinformatics (Elective)	3	0	0	3	6
CSD 501	Project Phase I	0	0	6	6	6
CSL 524	Real Time Systems (Elective)	3	0	0	3	6
CSD 502	Project Phase II	0	0	18	18	18
	TOTAL	33	0	38	69	104

Course Code and Title
CSL522 : Advances in Compiler Construction

1. **Course Description**

   The study of construction of compilers and compiler optimizations based on data flow analysis and parallelizing compilers.

   Credit scheme - (L-T-P-C: 3-0-2-8)

2. **Required Background or Pre-requisite:** Basic Compilers course in B.tech.

3. **Detailed Description of the Course**

   - Review of compiler fundamentals – lexical analysis, parsing, semantic analysis and intermediate code generation, error recovery, run time storage management, code generation.   (4 weeks)

   - Code optimization – Peephole optimization, control flow analysis, data flow analysis, dependence analysis, redundancy elimination,loop optimization, procedural and interprocedural optimization, instruction scheduling.   (3 weeks)

   - Compiling for High performance architectures, Compiling for scalar pipeline, compiling for vector pipeline, superscaler and VLIW processors, compiling for multiple issue processors, compiling for memory hierarchy.Parallelization and Vectorization, Dependence and dependence testing.   (3 weeks)

   - Loop Normalization, Induction variable Exposure, Enhancing Fine Grained Parallelism, Loop Interchange, Scalar Expansion, Scalar and Array Renaming, Node splitting, Index-set splitting, Loop skewing.

                                                                                          (4 weeks)

Typical Laboratory Experiments: Assignments based on techniques covered.

4. **Text books and/or other required material**
   - Optimizing Compiler for Modern Architecture: A dependence based approach , Randy Allen, Kennedy
   - Advanced Compiler Design and implementation : Steven S. Muchnick
   - Engineering & Compiler : Keith D. Cooper & Linda Torczon: Morgan Kaufmann

5. **Course Objectives**
   - Appreciation of parsing and code generation techniques
   - Understanding of optimizations problems and issues, data flow analysis framework and mathematical modeling
   - Appreciation of role of machine specific issues in compiler construction, the choice of instructions, the availability of registers etc.

- Ability to combine different optimization techniques to achieve the overall objective of program efficiency
- Appreciation of optimization techniques for multi-processor machines and parallelizing optimization schemes

6. **Class/Laboratary Schedule**
   Lectures : 3 1-hr lectures per week

   Lab: One 2 hr session per week

7. **Contribution of Course to Professional Component**

   Lecture: Students learn about different compiler optimization techniques, the role of processor architecture and applications of optimization techniques.

   Lab: Students learn to implement different techniques to construct a compiler.

8. **Evaluation of Students**
   The instructor uses the following methods: home-work assignments, 2 sessional exams, end-semester exam and course project, one-on-one discussions during office hours, laboratory experiments and programming assignments.

9. **Relationship of Course Objectives to Program outcomes**

   The coorelation of the COs of the course Advances in Compiler Construction and the POs are shown in the following table. A 'H', 'M', or 'L' mark on a cell indicates whether the COs have a 'high', 'medium', or 'low' correlation with the corresponding PO on the coloumn. A blank cell inidicates that there is no correlation between the COs to a particular PO.

   Correlation of COs of Advances in Compiler Construction

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
H	H	H	M	M		L	H	M	L	M	L

Course Code & Title

CSL517: Pattern Recognition

1. Course Description:
The course is introduced to teach concepts of pattern recognition which is used in the applications like document analysis, medical imaging. The concepts like statistical and syntactic pattern recognition, feature selection, feature generation, error analysis, and various methods of designing classifiers are important from industry perspective.

2. Required Background or Pre-requisite: Probability theory, Linear Algebra

3. Detailed Description of the Course
- Introduction:Pattern Recognition, Challenges, advance concepts(01 Week)
- Probability Theory: Basic concepts, Random variable, Discrete distribution, Continuous distribution, Continuous distribution(01 Week)
- Probability generating and moment generating functions, : Functions and operations on random variable, Estimation of distribution parameters(01 Week)
- Confidence interval estimation, Hypothesis testing and type I and II errors(01 Week)
- Goodness of Fit test, Joint distribution and correlation analysis(01 Week)
- Classifiers: Building classifier for single feature using Bay's rule and error analysis, decision boundaries for various cases (01 Week)
- Building classifiers using KNN, Parzen windows(01 Week)
- Building linear classifiers(01 Week)
- Building linear classifiers using SVM(01 Week)
- SVM optimization(01 Week)
- Building classifiers using syntactic methods(01 Week)
- Context dependant classification(01 Week)
- Feature generation(01 Week)
- Unsupervised learning(01 Week)

4. Text books and/or other required material

- **Probability and Statistics with Reliability**, Queuing, and Computer Science Applications, Kishore Trivedi, John Wiley and Sons, New York, 2001.
- **Pattern Recognition**, 4th Edition from Sergios **Theodoridis**, Konstantinos Koutroumbas. Elsevier ,ISBN-9781597492720, Printbook , Release Date: 2008.
- Pattern Classification, 2nd Edition, Richard O. **Duda**, Peter E. **Hart**, David G. Stork. Wiley, ISBN: 978-0-471-05669

5. Lab Experiments
- Generating features for two classes and analyzing them.
- Building classifiers for two classes using Bay's rule.
- Building classifiers for multiple classes using Bay's rule.
- Building classifiers for two classes using linear classifier.
- Building classifiers for two classes using SVM
- Implementation of clustering of patterns

6. Course Objective:

Upon successful completion of this course, each student should be able to

- Understand how to generate pattern features using various transforms based on data.
- Understand how to analyze pattern features using probability theory.
- Understand how to build classifiers using known probability distribution.
- Understand how to build classifiers using non parametric methods.
- Understand how to build linear classifiers using perception model.
- Understand how to build linear, nonlinear classifiers using SVM model.
- Understand how to build classifiers using syntactic model.
- Understand theory of unsupervised learning.

7. Class and Lab Schedule

Lecture : Three per week(60min)

Lab: One per week(120min)

8. Contribution of Course to Professional Component

Lecture: Student learns about theory of classification, building classifiers, analyzing accuracy of classifiers.

Lab: Student learns about implementation of various classifiers for various types of applications.

9. Evaluation of students:

The instructor evaluates outcomes using the following methods:

- Assignments
- Midterm exams
- Quizzes
- Laboratory assignments
- The student grades are decided based on the following factors:
- Assignment
- Midterm exam
- Final exam
- Lab viva

10. Relationship of Course Objectives to Program outcomes

The correlation of the COs of the course Pattern Recognition and the POs are shown in the following table. A 'H', 'M', or 'L' mark on a cell indicates whether the COs have a 'high', 'medium', or 'low' correlation with the corresponding PO on the coloumn. A blank cell inidicates that there is no correlation between the COs to a particular PO. Correlation of COs of Pattern Recognition

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
H	H		H	M		M	M	M	L	L	L

Course Code and Title

CSL 514: Advances in Algorithms

1. Course Description

Asymptotic complexity, Study of the design technique for algorithms such as divide-and-conquer, greedy method, dynamic programming, backtracking and branch-and-bound, convex hull, closest pair of points, FFT, polynomial multiplication, primality testing, text pattern matching, study of the theory of NP-completeness, approximation algorithms, randomized algorithms
3 lectures per week.   Credit scheme - (L-T-P-C: 3-0-0-6)

2. Required Background or Pre-requisite: Data Structures and Program Design

3. Detailed Description of the Course

- Asymptotic Notations-Big-Oh, Big-omega and Big-theta notations (1 week)
- Recurrence relations –Substitution method   (2 weeks)
                              Change of variables

                              Master Method

                              Characteristic Equation

                              Generating Functions

- Analysis of Algorithms-Best case, Worst case and Average case   (1 weeek)
- Divide-and-conquer-skeleton of the technique, binary search, quick sort, merge sort,   (2 weeks)
- FFT, closest pair of points, polynomial multiplication   (1 week)
- Greedy method-basic technique, job sequencing with deadlines, minimum spanning trees, all point shortest paths   (1 week)
- Dynamic Programming-basic fundamentals of the technique, application to multistage graph problem, longest common subsequence problem, travelling salesman problem   (2 weeks)
- Backtracking-basic fundamentals of the technique, application to n-queens problem,   graph colouring problem, Hamiltonian cycles problem   (1 week) Branch-and-bound-description of the technique, illustration through suitable Examples
- Theory of NP-completeness- Definition of the terms NP, NP-hard and NP-complete, showing NP-completeness of a problem   (2 weeks)
- Approximation algorithms   (1 week)
- Randomised algorithms   (1 week)

4. **Text books and/or other required material**
   - E. Horowitz, S. Sahni, S. Rajasekaran, Fundamentals of Computer Algorithms, University Press, Second Edition.
   - Thomas H. Cormen et al., Introduction to Algorithms, PHI, Second Edition.

5. **Course Objectives**
   - Appreciate the need for analysis of algorithms.
   - How to analyze the best-case, average-case and worst-case running times of algorithms using asymptotic analysis.
   - Know the standard design techniques of algorithms and know the conditions in which each particular technique is to be applied.
   - Design efficient algorithms for problems encountered in common engineering design situations.
   - Know the limitations on the time complexity of algorithms i.e. the theory of NP-completeness.

   - Study approximation algorithms and randomized algorithms to address the limitations on the time complexity of complexity

6. **Class Schedule**
   Lectures : 3 1-hr lectures per week

7. **Contribution of Course to Professional Component**

   Students learn techniques for design of algorithms. They also learn to apply these techniques to various problems. They also learn how to analyse the algorithms, they know the limitations on the time complexity of algorithms and how to address the same.

8. **Evaluation of Students**

   The students are evaluated through 2 sessional exams, end-semester examination.

9. **Relationship of Course Objectives to Program outcomes**

   The correlation of the COs of the course Analysis of Algorithms and the POs are shown in the following table. A 'H', 'M', or 'L' mark on a cell indicates whether the COs have a 'high', 'medium', or 'low' correlation with the corresponding PO on the column. A blank cell inidicates that there is no correlation between the COs to a particular PO.

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
H	H					H	L		L	M	M

- **Note: Please refer Appendix-A for all other Courses in the program curriculams**

2.2.2. Explain how modes of delivery of courses help in attainment of the POs (5)
(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 POs. This may be further justified using the indirect assessment methods such as course-end surveys.)

- The main delivery method for the courses is lecture interspersed with discussion. This helps in the obtaining a sound understanding of the course fundamentals, design and implementation issues, etc.
- In some courses, the design and experimentation issues are also discussed in the form of specific programs and the simulators over which the experimentation is carried out. The students are thus exposed to different tools for implementation and experimentation.
- Many courses have programming assignments/ course projects, in which the students are expected to build small realistic systems and perform experiments on them. Through this, students go through the entire software engineering lifecycle and understand the design and the integration issues in building a complete system.
- Some courses, require the students to write a small paper and make a presentation on a specific engineering problem/ design technique. The communication skills of the students are sharpened due to this.
- In many fundamental courses, a stress is given on the application of the algorithms taught in the courses in solving specific engineering problems from different disciplines. With this, the students are able to abstract out a problem definition by discussion on interdisciplinary topics and undersand the modeling and adaptation of techniques for solution of these problems.
- In the project, students perform extensive literature survey on an area of interest. They are then motivated to forumlate a new problem and work at discovering their solution techniques. They implement some of the techniques, and perform extensive experiementation to compare their techniques with the existing ones. They are encouraged to write a paper and communicate their work.

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 (15)
(Describe different types of course assessment and evaluation methods (both direct and indirect) in practice and their relevance towards the attainment of POs)

The direct assessment methods are the following.

1. Two sessional exams and one end-semester exam (which are mainly pen and paper). The knowledge, application and presentation skills are assessed using these.
2. A few courses have class tests in additon to these.
3. A few courses have assignments which might either be solving a problem using pen and paper, preparing a report, or writing small programs. These assess whether a student is able to apply the knowledge learnt for different kinds of problems, make a judicious choice of the techniques learnt for implementation and also the writing skills.
4. A few courses have a course project. The course project typically involves building a complete system. In this, a student has to design the system, make a proper choice of the techniques to be used, implement the system, and fine-tune the system after performing experimentation. These help in the achievement of POs 1, 2, 3, 4, 5, and 6.

5. The final year project has two evaluations – one at the end of the odd semester and the other at the end of the even semester. After the odd semester, a student is supposed to report the literature survey and clearly state the problem on which he would be working. If some implmentation has already been carried out, he has to explain the technique. At the end of the even semester, the students make a formal presentation explaining their entire work. They also give a demonstration of the system or the technique which they have developed. This is done in the presence of an external examiner, who are typically people from the industry or academia having about 10 years of experience. This helps in the achivement of POs 1, 2, 4, 8, 9, 10, 11, and 12.

The indirect assessment methods are the following.

1. At the start of the final year, the students undergo written tests and interviews for campus placements. The faculty interacts with the industry colleagues and also with the students regarding the kind of questions posed so that the PEOs and the POs of the courses can be refined further.

2.2.4. Indicate the extent to which project work / thesis contributes towards attainment of POs (50)

(Justify how the project works/thesis works carried out as part of the programme curriculum contribute towards the attainment of the POs.)

Since Computer Science and Engineering is highly practical oriented, the laboratory and project course work contribute highly towards attainment of the POs. The students are encouraged to build complete systems using different programing languages and other existing tools. Using these, they gain the experience of the entire software engineering lifecycle.

The thesis work is an important component towards the attainment of the POs – specially PO 10, PO 11, and PO 12. It urges students to read recent literature, formulate problem and suggest solutions. Implementation of the solutions and the comparison with existing techniques is also suggested.

2.3.Evaluation of the attainment of 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. Also include information on:

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;

The description of the assessment process is mentioned with each course. The question papers of the examinations, the internal course projects, assignments, etc. will be made available by the individual faculty who teach the courses.

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

The assessment processes for the attainment of Program Outcomes are described in detail in 2.2.3. Their frequency is also mentioned in 2.2.3.

2.3.2. Indicate results of evaluation of each PO (100)
c) The expected level of attainment for each of the programme outcomes;

The individual teachers would explain the level of attainment of the POs.

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

At the end of the semester, the department faculty meet to discuss the performance of the students in all the courses. The question papers, the assignments, laboratory programming exercises, etc. are discussed. Representative answers, term papers, programs of students are discussed in order to understand whether the course outcomes of the courses stated are achieved by the students. Based on these, for each course, quantitative assessment is done for each course objective. Since, the course objectives are aligned with the POs, the attainment of the POs is also attained by this quantitative measure.

e) How the results are documented and maintained.

Every faculty member keeps a record of all the examinations conducted for the last three years. At the end of the end-semester examination, the results are uploaded on the institute server for result preparation.

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

The results of the evaluations would be discussed in departmental meetings so that the curriculum of the courses and the labs would be improved. This has always been done by the department in the past. After a thorough discussion among the faculty of the department, the curriculum is discussed in detail in the meeting of the Board of Studies, in which there are members from the external world both academia and the industry. After a conensus is achieved, the curriculum of the courses and the schemes are updated and a recommendation is sent to the Senate for approval.

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

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

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

The following improvements were brought in after a review of the attainment of the POs.

1. More assignments were given informally and the students were encouraged to solve those. Some of the assignments were in the form of developing a piece of software. Some credit was given to the assignments.
2. In response to the student feedback, most of the course material is covered through the chalk and blackboard method instead of using the LCD projector and slides.

2.4.2. State the process used for revising/redefining the POs (15)
(Articulate with rationale how the results of the evaluation of POs have been used to review/redefine the POs in line with the Graduate Attributes of the NBA.)

The POs have been defined for the first time by the Department. However, the broad guidelines as specified by NBA were already adhered to by the department and its faculty member even before preparation of the SAR.

3. Programme Curriculum (75)

3.1.Curriculum (15)

3.1.1. Describe theStructure of the Curriculum (5)

Course Code	Course title	Total number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical #(P)	Total Hours	
....	....					
CSL 522	Advances in Compiler Construction	3	0	2	5	8
CSL 517	Pattern Recognition (Elective)	3	0	2	5	8
CSL 523	Advanced Computer Architecture	3	0	0	3	6
CSL 514	Advances in Algorithms	3	0	0	3	6
CSP 520	Software Lab- I	0	0	2	2	2
CSL 528	Cryptography and Information Security	3	0	0	3	6
CSL 519	Distributed Systems	3	0	2	5	8
CSL 520	Distributed and Prallel Databases	3	0	2	5	8
CSP 529	Technical Writing and Publishing	0	0	2	2	2
CSP 531	Software Lab – II	0	0	2	2	2
CSL 516	Soft Computing Techniques (Elective)	3	0	0	3	6
CSL 521	Software Architecture (Elective)	3	0	0	3	6
CSL 436	Information Retrieval (Elective)	3	0	0	3	6
CSL 530	Topics in Bioinformatics (Elective)	3	0	0	3	6
CSD 501	Project Phase I	0	0	6	6	6
CSL 524	Real Time Systems (Elective)	3	0	0	3	6
CSD 502	Project Phase II	0	0	18	18	18
	TOTAL	33	0	38	69	104

Curricular Composition	Credits
Theory courses	66
Laboratory courses	12
Seminars	2
Project works	24
Total	104

3.1.2. Justify how the curricular structure helps for the attainment of the POs and the PEOs (10)
(Articulate how the curricular structure helps in the attainment of each PO and PEO)

The course outcomes of every course and their mapping to the POs are listed in section 2.2.1 of the SAR. This provides the justification for the above.

3.2. Indicate interaction with R&D organisations / Industry (40)

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

1. The department has a project sponsored by IBM, with which a cloud computing laboratory would be set up.
2. Typically, every month, there is a lecture organized from persons working in the industry to talk about the current industry trends.

3.3. Curriculum Development (15)

3.3.1. State the process for designing the programme curriculum (5)
(Describe the process that periodically documents and demonstrates how the programme curriculum is evolved considering the PEOs and the POs)
The program curriculum is first discussed in faculty meetings to evaluate the attainments of the POs and the PEOs. Then, the curriculum is discussed in deatil in the Board of Studies (BOS) meeting for any modifications. Finally, the recommendation of the BOS is placed before the Senate for approval.

3.3.2. Illustrate the measures and processes used to improve courses and curriculum   (10)
(Articulate the process involved in identifying the requirements for improvement in courses and curriculum and provide the evidence of continuous improvement of courses and curriculum)

The results of the evaluations would be discussed in departmental meetings so that the curriculum of the courses and the labs would be improved. This has always been done by the department in the past. After a thorough discussion among the faculty of the department, the curriculum is discussed in detail in the meeting of the Board of Studies, in which there are members from the external world both academia and the industry. After a

conensus is achieved, the curriculum of the courses and the schemes are updated and a recommendation is sent to the Senate for approval.

3.4.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 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

All these details are given in Section 2.2.1 of the SAR.

4. Student Performance (100)

4.1 Admission intake in the programme (15)

YEAR	Sanctioned Strength of the Programme	Number of Students Admitted	Percentage of seats filled	Number of Students Admitted with Valid GATE Score/PG entrance of State	Percentage of Student with valid GATE Score/PG entrance of State
CAY	20	20	100%	20	100%
CAYm1	20	20	100%	20	100%
CAYm2	20	20	100%	20	100%
CAYm3	20	19	95%	19	95%

Average percentage of seats filled through approved procedure = 98.75
Average percentage of students admitted with valid GATE Score/PG entrance of state =98.75

YEAR	Number of Students Admitted	API = Academic Performance Index = Average CGPA or Average Marks on a scale of 10 (Compiled from the Graduation Records)
CAY	20	7.86 (Total Pass 18)
CAYm1	20	8.03(Total Pass 17)
CAYm2	20	7.89(Total Pass 17)
CAYm3	19	7.73(Total Pass 16)

Average API = 7.87

4.1.1 Number of seats filled through the admission procedure approved by the University (5)

All seats are filled by MHRD using centralized procedure

4.1.2 Quality of students as judged from their complete graduation records (5)
Assessment = 11.805

4.1.3 Number of students admitted having a valid GATE score/PG entrance of state (5)

Assessment = 987.5

4.2. Success Rate (20)

Provide data for the past three batches of students

GI = Graduation Index
= (Number of students graduated from the programme) /
(Number of students joined the programme)

YEAR	Number of Students Graduated from the Programme	Number of Students Joined Programme	GI
LYG	18	20	0.9
LYGm1	17	20	0.85
LYGm2	17	20	0.85

Average GI =0.87
Assessment = 20 x Average GI=17.33

4.3. AcademicPerformance (20)

4.3.AcademicPerformance (20)

API = Academic Performance Index
= Average CGPA or Average Marks
on a Scale of 10

YEAR	Number of Students in the Batch	API
LYG	20	8.03
LYGm1	20	7.89
LYGm2	19	7.73

Assessment = 2 x Average API =15.77

4.4. Placement and Higher Studies (20)

Assessment Points = 20 × (x + 3y)/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 to maximum assessment points = 20.

Item	2012-13	2011-12	2010-11
Number of admitted students corresponding to LYG(N)	20	20	19
Number of Students who obtained jobs as per the record in the industry/ academia	11/15	11/19	13/17
Number of Students who opted for higher studies with valid qualifying scores/ranks (y)	-	-	-
Assessment points	-	-	-

4.5.   Professional Activities (25)

4.5.1. Membership in Professional Societies/Chapters and organising engineering events(5)

(Instruction: The institution may provide data for past three years).
1. **Members of the ACM students chapter at the institute.**
2. **Helped in organizing ACM Nagpur chapter workshop on "Business analyitics" in 2012.**

4.5.2. Participation and their outcomes in international/national events (5)

(Instruction: The institution may provide data for past three years).
Participation in DEP workshops conducted by IIT Bombay

1. **2012 – Workshop on "Database Management Systems"**
2. **2010 – Workshop on "Effective teaching of Computer Programming"**

Outcomes – Better help on a larger scale for conducting programming labs for 1st year students and managing departmenal B.Tech. labs.

4.5.3. Publication and awards in international/national events (10)

(Instruction: The institution may list the publications m e n t i o n e d   e a r l i e r along with the names of the editors, publishers, etc.).
1. **Meera Dhabu, Dr. P. S. Deshpande, Siyaram Vishwakarma. Partition based Graph Compression, International Journal of Advanced Computer Science and Applications,Vol. 4, No. 9, 2013.**
2. **Poster Presentation "Coupled neurons on a scale-free network" by Kishen Kumar and Awadhesh Verma, at International Conference on Structural and Functional Genomics**

4.5.4. Entrepreneurship initiatives and innovations (5)
(Instruction: The institution may specify the efforts and achievements.)

5. Faculty Contributions (200)

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

Name of the faculty	Qualification, university, and year of graduation	Designation and date of joining the institution	Distribution of teaching load			Number of research publications in journals and conferences since joining	IP Rs	R&D and Consultancy work with amount	Holding an incubation unit	Interaction with outside world
			1st Year	UG	PG					
O.G. Kakde	PhD, Nagpur University, 2004	Professor 29/12/1988	-	-		Journals – 25		-	O.G. Kakde	PhD, Nagpur University, 2004
Dr. S. R. Sathe	B.E., M.Tech., Ph.D.	Professor 29/12/1988	66.66	33.33		Journals-16 Conferences-21		AR&DB- Rs. 10.5 lacs ISEA-Rs. 24.41 lacs	Dr. S. R. Sathe	B.E., M.Tech., Ph.D.
P.S. Deshpande	PhD, Nagpur University, 2004	Associate Professor, 07/22/1992	50%	50%		11 Papers + 8Books		1.Evaluation of Financial System for ERP(Rs.22,060/-) 2. Data Center Technical bid evaluation(Rs.48,120/-) 3. Strategy planning for Computerization & Draft preparation of Request For Proposal Document (Rs.44120/-) Information Audit of Nagpur Municipal Corporation (Rs.12,000,00)	P.S. Deshpande	PhD, Nagpur University, 2004

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

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

$U1$ = Number of Students in UG 2nd Year
$U2$ = Number of Students in UG 3rd Year
$U3$ = Number of Students in UG 4th Year
$P1$ = Number of Students in PG 1st Year
$P2$ = Number of Students in PG 2nd Year
$N1$ = Total Number of Faculty Members in the Parent Department

S = Number of Students in the Parent Department
= U1 + U2 + U3 + P1 + P2

Student Teacher Ratio (STR) = S / N1

Assessment = [20 x 13 /STR], subject to maximum of 20.

Year	U1	U2	U3	P1	P2	S	N1	STR	Assessment
CAY	100	100	104	20	20	344	17	20.24	12.84
CAYm1	109	94	98	20	20	341	14	24.35	10.67
CAYm2	110	90	102	20	19	341	16	21.31	12.20
CAYm3	105	89	91	19	17	321	16	20.06	12.96

Average Assessment = 12.17

5.2. Faculty strength in PG programme (20)

X = Number of faculty members with Ph.D available for PG Programme
Y = Number of faculty members with Ph.D. / M.Tech. / M.E available for PG Programme

Assessment will be done on the basis of the number of faculty members with Ph.D./M.Tech./M.E., available for the PG programme. [Minimum number suggested: 4]

	X	Y	Assessment
CAY	04	17	4.71
CAYm1	04	14	5.71
CAYm2	04	16	5

Assessment = 20 x [X/Y]

Average Assessment = 5.14

5.3.Faculty Qualifications (30)

Assessment	=		4 x FQI
Where FQI	=		Faculty Qualification Index
	=		$(10x + 6y + 4 Z_0)/ N2$ Such that, $x + y + z_0 \leq N2$; and $z_0 \leq z$
Where x	=		Number of faculty members with PhD
y	=		Number of faculty members with ME/M. Tech
z	=		Number of faculty members with BE/ B. Tech/ M. Sc

	x	y	N	z	FQ	Assessment
CAY*m2*	5	7	20	4	5.4	16.2
CAYm1	5	9	20	0	5.2	15.6
CAY	5	12	20	0	6.1	18.3
	Average assessment					16.7

5.4. Faculty Competencies correlation to Programme Curriculum (15)

(Indicate the faculty competencies (specialisation, research publication, course developments etc.) to correlate the programme curriculum)

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

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

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

Name of the faculty	Max. 5 per faculty		
	CAYm2	CAYm1	CAY
U.A.Deshpande	5	5	5
M. M. Dhabu	3	1	3
A.Tiwari	3	--	--
S.A. Raut	9	6	6
Deepti Shrimankar		5	6
Sum	20	17	20
N(Number of faculty positions required for an STR)	20	20	20
Assessment = 3 x Sum/N	3	2.55	3
Average Assessments	2.85		

5.6.Faculty Retention (15)

Assessment$\quad= 3 \times \text{RPI}/N$
where RPI$\quad\quad$ = Retention point index
$\quad\quad\quad\quad\quad$ = Points assigned to all
$\quad\quad\quad\quad\quad\quad$ faculty members

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

Item	CAYm2	CAYm1	CAY
Number of faculty members with experience of less than 1 year(x_0)	03		03
Number of faculty members with 1 to 2 years experience	01	01	01
Number of faculty members with 2 to 3 years experience	01	02	
Number of faculty members with 3 to 4 years experience	01	01	01
Number of faculty members with 4 to 5 years experience			02
Number of faculty members with more than years experience(x_5)	10	10	10
N	20	20	20
RPI = x_1+ 2x_2+ 3x_3+ 4 x_4+ 5x_5	56	58	62
Assessment	8.4	8.7	9.3
Average Assessment			8.8

5.7. Faculty Research Publications (FRP) (30)

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

The research papers considered are those (i) which can be located on Internet and/or are included in hard-copy volumes/proceedings, published by reputed publishers, and (ii) the faculty member's affiliation, in the published papers/books, is of the current institution.

Include a list of all such publications and IPRs along with details of DOI, publisher, month/year, etc.

Name of faculty (controlling to FRP)	FRP points (max. 5 per faculty)		
	CAYm2	CAYm1	CAY
P. S. Deshpande	4	1	1
S. R. Sathe	3	5	2
U.A.Deshpande		1	1
A.S.Mokhade		1	1
M.P.Kurhekar			1
M. M. Dhabu	1	-	1
A. Tiwari	1	-	-
S.A.Raut	2	2	
D.D.Shrimankar	1	2	4
Sum	12	12	11
N(Number of faculty positions required for an STR of 15)	20	20	20
Assessment of FRP = 6 x Sum/N	3.6	3.6	3.3
Average Assessment			3.5

Publication List :

Sr. No.	Title of Paper	Name of Faculty	Name Journal/Conference
01	Cardinality Statistics Based Maximal Frequent Item set Counting	Meera Dhabhu Dr.P.S.Deshpande	6th International Conference on Information Systems and Technology at University of Florida , Greenoble France 28-30 March 2012
02	Layered Filtering Technique for Content - Based Video Retrieval	Rohit Konedkar, Galshan Saluja, Akash Gupta, Shweta Maroo,	International Conference on Computer and Information Sciences 2012, Universiti Teknologi PETRONAS

		P.S.Deshpande	Malysia
03	MapReduce Based Hybrid Genetic Algorithm Using Island Approach for Solving Time Dependent Vehicle Routing Problem	Rohit Konedkar, Galshan Saluja, Akash Gupta, Shweta Maroo, P.S.Deshpande	International Conference on Computer and Information Sciences 2012, Universiti Teknologi PETRONAS Malysia
04	Intelligent Multidimensional Modeling	Swati Heera P.S.Deshpande	GSTF Business Intelligence Asia Pacific Summit 2012 Singapore on 14-Sep-2012
05	A Modified Fastmap K-Means Clustering Algorithm for Large Scale Gene Expression Datasets	S. A. Raut, S. R. Sathe	International Journal of Bioscience Biochemistry and Bioinformatics, Vol. 1, No. 4, November 2011, 06pp. 292-296
06	A Tile-based Parallel Global Algorithm for Biological Sequence Alignment on multi core architecture	D. D. Shrimankar, S. R. Sathe	Journal of Information and Communication Technologies, Vol. 2, Issue 2, Feb. 2012.
07	Architecture Aware Programming on Multi-Core Systems	M. R. Pimple, S. R. Sathe	International Journal of Advanced Computer Science and Applications, Vol. 2, No. 6, 2011, pp. 105-111
08	Comparison of OpenMP and OpenCL Parallel Processing Technologies	Krishnahari Thouti, S.R.Sathe	International Journal of Advanced Computer Science and Applications (IJACSA) Vol. 3, No.4, 2012, pp. 56-61 and also CoRR abs/1211.2038 (2012).
09	An OpenCL Method of Parallel Sorting Algorithms for GPU Architecture	Krishnahari Thouti, S.R.Sathe	International Journal of Experimental Algorithms (IJEA), Volume(3), Issue (1), 2012, pp.1-8.
10	Performance Analysis of Single Source Shortest Path Algorithm over Multiple GPUs in a Network of	Krishnahari Thouti, S.R.Sathe	International Journal of Computer Applications Vol.77(9):31-36, September

	Workstations using OpenCL and MP		2013.
11	Bioinformatics: Trends in Gene Expression Analysis	S. A. Raut, S. R. Sathe	Proceedings of International Conference on Bioinformatics and Biomedical Technology (ICBBT 2010) held at Chengdu, China, 16-18 April 2010, pp. 97-100.
12	Parallelization and Implementation of Global Sequence Alignment using Tiling and OpenMP	D.D. Shrimankar, S. R. Sathe	Proceedings of Annual International Conference on Advances in Distributed and Parallel Computing held at Singapore from 1-2 November 2010, pp. R-31-R-36.
13	Parallelization of DNA Sequence Alignment using OpenMP	D.D. Shrimankar, S. R. Sathe	Proceedings of the International Conference on Communication, Computing & Security (ICCCS 2011) held at Rourkela from February 12–14, 2011, pp. 200-203.
14	Implementation of parallel algorithms on cluster of Workstations	Shrimankar D D, Sathe S. R	**2nd IEEE International Conference on** Parallel Distributed and Grid Computing (PDGC) 2012, pp. 126- 31, Jayppe University of Information technology, Wakhnaghat, India, Dec 6-8, 2012, pp. 126-131.
15	Solving N-Queens Problem on GPU Architecture	Krishnahari Thouti, S.R.Sathe	IEEE 2nd International Conf. on

	using OpenCL with Special Reference to Synchronization Issues		Parallel, Distributed and Grid Computing, Jaypee University of Information Technology, Wakhnaghat, Dec.6-8, 2012, pp. 806-810.
16	Overview of Selection Schemes in Real-coded Genetic Algorithms and Their Applications	Anil S. Mokhade & Omprakash G. Kakde	2nd International Conference on Software and Intelligent Information (ICSII 2013) (Workshop of ICGIP-2013), October 26-27, 2013, Hong Kong, By International Association of Computer Science and Information Technology
17	Achieving Excellence in Research with Problem-Solving Attitude and Techno-Managerial Approach-Refreshing Lessons for Leadership in Higher Education	Anil S. Mokhade	2nd National Conference on "Excellence in Higher Education"-Transformational Leadership, June 28 – 30,2012, Department of Management Studies, IIT Delhi

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

(Instruction: A faculty member scores a maximum of five FIPR points. FIPR includes awarded national/international patents, design, and copyrights.)

Name of faculty (controlling to FIPR)	FRP points (max. 5 per faculty)		
	CAYm2	CAYm1	CAY
....			
....			
.... Sum			
N			
Assessment of FRP = 2 x Sum/N			
Average Assessment			

5.9.Funded R&D Projects and Consultancy (FRDC) Work (30)

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

Five points for funding by national agency,

Four points for funding by state agency,

Four points for funding by private sector, and

Two points for funding by the sponsoring trust/society.

Name of faculty (controlling to FIPR)	FRP points (max. 5 per faculty)		
	CAYm2	CAYm1	CAY
P.S.Deshpande & A. S. Mokhade		4	4
S.R.Sathe	5	5	
U.A. Deshpande & R.B.Keskar	4		
U.A. Deshpande, R.B.Keskar M. P.Kurhekar			2
M.P.Kurhekar & R.B.Keskar			2
Sum	9	9	8
N	20	20	20
Assessment FPPC = 4x Sum/N	1.8	1.8	1.6
Average assessment			1.73

5.10. Faculty Interaction with Outside World (15)

FIP = Faculty interaction points

Assessment = 3 × (Sum of FIP by each faculty member)/N

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

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

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

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

Name of faculty (controlling to FIP)	FIP points (max. 5 per faculty)		
	CAYm2	CAYm1	CAY
Prof. U.A. Deshpande, Prof. M.P. Kurhekar, Prof. R.B. Keskar			6
Prof. U.A. Deshpande, Prof. M.P. Kurhekar, Prof. R.B. Keskar , M.A. Radke			3
Prof. U.A. Deshpande, Prof. R.B. Keskar	3		
Sum	3		9
N	20		20
Assessment of FRP = 3 x Sum/N	0.45		1.35
Average Assessment			0.6

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 space...
No. of Class Rooms (Five)	1. for 2nd Year UG 2. for 3rd Year UG 3. for 4th Year UG 4. for 1st Year PG 5. for 2nd Year PG	1. Exclusive 2. Exclusive 3. Exclusive 4. Exclusive 5. Exclusive	1. 110 students 2. 110 students 3. 110 students 4. 40 students 5. 50 students	1. With PC, Internet 2. With PC, Internet 3. With PC, Internet 4. With PC, Internet 5. With PC, Internet
Tutorial Rooms	-------	----	------	-----
No. of Seminar Rooms	-------	----	------	-----
No. of Meeting Rooms (One)	For departmental meetings, discussions etc	Shared with other activities like Exam control room	20	Yes
No. of Faculty Rooms	17	1. Exclusive for Permanent Faculty 2. Shared for Adhoc Staff	1 each	Yes

6.1. Classrooms in the Department (15)

6.1.1. Adequate number of rooms for lectures (core/electives), seminars, tutorials, etc., for the programme (5)
Adequate rooms are available for conducting regular core and elective subjects however, seminars / tutorials / extra lectures are conducted in the available class rooms.

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

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

All the class rooms are equipped with the necessary teaching aids like, computer with internet connection, projectors, multimedia speakers etc.

6.1.3. Acoustics, classroom size, conditions of chairs/benches, air circulation, lighting, exits, ambience, and such other amenities/facilities (5)
All the above amenities / facilities are available in the class rooms.

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

6.2. Faculty Rooms in the Department (15)

6.2.1. Availability of individual faculty rooms (5) **YES**

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

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

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

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

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

The following table is required for the subsequent criteria.

Laboratory description in the curriculum	Exclusive use/ shared	Space number of students	Number of experiments	Quality of instruments	Laboratory manuals
Computing Lab 1	Shared by 2nd & 4th year students	50	For 50 students	All state-of-art machines, Working	Software Available
Computing Lab 2	Shared by 3rd & 4th year students	80	For 80 students	All state-of-art machines, Working	Software Available
M.Tech. Lab 1	For 1st Year PG Students	25	For 25 students	All state-of-art machines, Working	Software Available
M.Tech. Lab 2	For 2nd Year PG Students	25	For 25 students	All state-of-art machines, Working	Software Available

6.3. Laboratories in the Department to meet the programme curriculum requirements   and the POs (30)

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

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

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

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

6.3.3. Availability of research facilities to conduct project works / thesis work (5) **YES**

(Articulate the facilities provided to carry out the project works/thesis).

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

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

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

There are sufficient computers to run the experiments such that every student gets individual machine to perform the experiment. All the computers as well as air conditioners in all the laboratories are in working condition and under regular annual maintenance contract.

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

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 gained	Responsibility
				At joining	Now		
M.R.Pimple	Programmer	Exclusive	01/12/1990	B.E.	M.Tech	Attended conferences, workshops in parallel computing. Published papers in journal, conference in this area.	Overall in-charge of all laboratories in the department, procuring, maintaining, upgrading machines, software etc, involved in teaching.
M.B. Bhi	Technical Officer	Exclusive	09/03/1995	B.E.	M.Tech DBM	1) Attended workshops/conferences (National-International Conference in parallel Computing(Cluster and Grid paralllel Computing) 2) Published papers in refereed conferences/ conferecnes and book chapter in fault toelernt in parallel systems lke grid and cluster 3) CCNA Networking	Overall responsible for Internet and network services of the Institute. Overall responsible for monitoring , configuring, upgradation and maintenance of networking system like switches, routers etc as well network softwares like PRTG and NMS. Maintenance and updation of webserver of VNIT as

						Technical Training, java and other technical related courses. Self study for Joomla , wordpress and moodle, etc.	well departments, mail server, UTM firewall , proxies for academic, quarters and hostels and NKN line, , HP core switch. Email Account creation for students also in bulk and maintenance. and other day-to-day activities as and when its necessary.
D.S. Deshpande	Sr.Technical Asstt.(Comp)	Exclusive	23/06/1999	B.Sc., PGDCA	MCM	1. Short term course of VB.Net 2. Rich Internet Application course 2. Attended a Spoken Tutorial workshop on PHP MySQL organized by IIT, Mumbai at VNIT and successfully passed the online exam.	Overall in-charge of all departmental activities including office automation, academic, examination, accounts work

| R.S.W arthi | Technical Assistant (Comp.Sci) | Exclusive | 17/05/2008 | Diploma in Comp.Tech., Diploma in Comp. Hardware & Networking | B.E. Comp. Tech. | 1. Rich Internet Application course

2. Attended workshops (ISTE, IITB) on Database Mgmt, PHP, MySql/Linux | 1. Maintaining CSE labs

2. Assisting in solving h/w & s/w problems faced by students

3. Responsible for smooth conduct of semester laboratory courses. |

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

In addition to available qualified technical staff, department needs additional technical supporting staff to handle the increased intake.

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

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

Presently no such scheme is available.

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

7. Teaching   Learning Process (75)

7.1.Evaluation process: course work (25)

7.1.1. Evaluation Process - Class test / mid-term test schedules and procedures for systematic evaluation, internal assessments. (10)

2 mid-sem exams (weightage around 30%),

1 End-sem exam (weightage – 60%) ,

Class-test/assignment/quiz/Internal-assessment (weightage – around 10%)

7.1.2. Seminar and Presentation Evaluation (10)

Assessment is based on the following:
1. Project phase-1 presentation seminar – internal assessment (25%)

2. Project report and external presenattion seminar – external assessment (75%)

7.1.3. Performance and Feedback [3]

Feedback forms filled up by students at the end of every semester. Almost 100% studnets participate in this process. Feedback analysis is done by generating statistics using grade points. Corrective actions taken according to feedback.

Number of corrective actions taken in the last three years:

1. **Improvement in lesson plan**
2. **Introduction of practical courses in MTech scheme**

7.1.4. Mechanism for addressing evaluation related grievances [2]

Class committees are set of for every class. The evaluation related grievances are conveyed to the class committee. The class committee aprises HoD of the feedback from the class committee and apropriate actions are taken at the department level.

7.2. Evaluation Process: Project Work / THESIS (25)

Details of Thesis Allocation, Evaluation and Presentation:

Year	Name of Candidate	Name of Supervisor	Title of Thesis	Whether Evaluation Committee was Constituted (Yes/No)	Name of the External Member	Thesis Presentation Dates
2011	Yogesh Chopde	Dr. P.S. Deshpande	Online Character Recognition	Yes	Dr Zaveri	June, 2011
2011	Rahul Voruganti	Dr. P.S. Deshpande	Optimizing frequent Pattern Search in Graph Database	Yes	Dr Zaveri	June, 2011
2011	Sunil Kumar Konapareddy	Dr. U.A. Deshpande	A MAC Layer Protocol for Wireless Sensor Networks with Deterministic Timing Guarantee	Yes	Prof. M. A. Zaveri	June, 2011
2011	Rajiv Ranjan Kumar	Dr. U.A. Deshpande	Energy Aware Technique for Mobile Object Tracking Using Wireless Sensor Network	Yes	Prof. M. A. Zaveri	June, 2011
2011	Sumanish Sarkar	Prof. R. B. Keskar	Predictive dynamic shortest path algorithms	Yes	Prof. M. A. Zaveri	June, 2011
2011	Madhavi Borkar	Prof. R. B. Keskar	Specification and Verification of CAN controller	Yes	Prof. M. A. Zaveri	June, 2011
2011	Sandipan Dutta	Prof. A. Tiwari	A study and approach to Design of Adhoc Network Simulator	Yes	Dr. R.B.V. Subramaniam	June, 2011
2011	Veena Soni	Prof. A.	Simulation and Comparison of	Yes	Dr. R.B.V.	June,

		Tiwari	Mobility Models in Adhoc Networks		Subramaniam	2011
2011	Digamber Kumar	Prof. S. A. Raut	Implementations of Load Balancing Algorithms	Yes	Vinit Kapoor	18th June, 2011
2011	Bhushan Deshpande	Prof. S. A. Raut	Content Based Imate Retrieval System using Colour, Texture and Edge Histogram Description	Yes	Vinit Kapoor	18th June, 2011
2012	Rishikesh Pathak	Dr. P.S. Deshpande	Graph classification using Maximum connected component	Yes	Dr Zaveri	June, 2012
2012	Amrapali Patil	Dr. U. A. Deshpane	Resource Allocation in Wireless Sensor Networks with Real-Time Constraints	Yes	Prof. A. K. Turuk	June, 2012
2012	Richa Kulkarni	Dr. U. A. Deshpane	Achieving Network Level Security In Wireless Sensor Network	Yes	Prof. A. K. Turuk	June, 2012
2012	T. Maheshwar Reddy	Dr. U. A. Deshpane	Technique for DNA Barcode Using String Mining	Yes	Prof. A. K. Turuk	June, 2012
2012	Kamal Bunkar	Prof. R. B. Keskar	Design of Elastic Application for Seamless Cloud Computing	Yes	Prof. Raja Datta	June, 2012
2012	Harshavardhan Dhanraj	Prof. R. B. Keskar	Design of Traffic Management System in Distributed Environment	Yes	Vinit Kapoor	December, 2012
2012	Saurav Chowdhur	Prof. A. Tiwari	Analysis of cross-layer design of Adhoc networks		Dr. M.A. Zaveri	June 2012

Year	Name	Guide	Title		Examiner	Date
	y		for real-time video streaming			
2012	Anshul Gupta	Prof. A. Tiwari	Performance Evaluation of Adhoc routing protocols using Omni and Directional Antennas		Dr. M.A. Zaveri	June 2012
2012	Ashuvenda Meshram	Prof. A. Tiwari	Static Binary Translation from IA-32 to ARM-based system		Dr. M.A. Zaveri	June 2012
2012	Prakash Choudhary	Prof. M. P. Kurhekar	An estimation of parameters for hidden morkov model to classification of biological sequences	Yes	Prof. A. K. Turuk	June, 2012
2012	Rahul Singh	Prof. S. A. Raut	Mining Frequent Pattern From XML Data	Yes	Dr. Deepak Singh Tomar	5th June, 2012
2013	Hari Krinsha	Dr. P.S. Deshpande	Number Plate Recognition in Videos	Yes	Dr. Subramaniam	June, 2013
2013	Shradhha Satpathi	Dr. P.S. Deshpande	Face Detection and Face Recognition in Images under Various conditions	Yes	Dr. Subramaniam	June, 2013
2013	V. Aneesha	Dr. U. A. Deshpande	Routing and Sampling Rate Assignment in Wireless Sensor in Networks with	Yes	Prof. A. K. Turuk	June, 2013

			Real-Time Constraints			
2013	Vedesh Mohandas	Dr. U. A. Deshpande	Performance Evaluation of Routing Algorithms in Delay Tolerant Networks using Opportunistic Network Environment	Yes	Prof. A. K. Turuk	June, 2013
2013	Shilpaja Upadhye	Prof. R. B. Keskar	Design and Implementation of Cognitive Inference Model	Yes	Prof. A. K. Turuk	June, 2013
2013	Usmanghani Bhurani	Prof. R. B. Keskar	Design and Implementation of Intentional Program Tree Generation	Yes	Prof. A. K. Turuk	June, 2013
2013	Ashish Gaigole	Prof. A. Tiwari	Performance evaluation of DSR Routing protocol in Adhoc network	Yes	Dr. M.A. Zaveri	June, 2013
2013	Dashrath Sharma	Prof. A. Tiwari	Analysis of DSR protocol in MANET	Yes	Dr. M.A. Zaveri	June, 2013
2013	Shital Sukdeve	Prof. M. P. Kurhekar	Parameter extimation of HMM model for classification of biological sequences	Yes	Prof. A. K. Turuk	June, 2013

7.2.1. Allocation of Students to Eligible Faculty Members (supervisors) [10]

A merit list of students is prepared at the end of the 1st year of M.Tech. A list of guides available is

73

announced to students. Choice of selecting a guide is given to students based on their rank in the merit list in order.

7.2.2. Constitution of Evaluation Committee with at least One External Member [10]

At the end of the project-phase-2, an evaluatio committee is formed cosnisting at-least one external member, who is typcially from IIT/NIT or industry expert. The committee is forwarded the project theses they are to evaluate much before the presentation seminar.

7.2.3. Schedule Showing Thesis Presentation at least twice during the semester [5]

The project is judged twice the year. As part of project-phase-1, evaluation is done at the end of 3rd semester in the month of November and 25% weightage of overall project is kept and grades are announced. This evaluation is done by an internal committee.

At the end of the project, evaluation committee consisting of at-least 1 external member is formed. The thesis is submitted before the presnetation for evaluation, the seminar takes place in which the theisis and the seminar are evaluated and 75 % weightage is kept for the evaluation.

7.3.Teaching Evaluation And Feedback System [10]

7.3.1. Guidelines for Student Feedback System [3]

At the end of every semester, every student is to give feedback about each course he/she has studied. The evaluation is divided into 2 parts, the teacher's evaluation and the course evaluation. The grade points are gathered and averaged out. Free form comments are used further to improve the teaching methodology.

7.3.2. Analysis of Feedback by HOD and the Faculty [2]

The feedback is analysed and grade points for every teacher for every subject on each evaluation criteria is calculated and the consolidate grade point is aggrgated and averaged. Every teacher looks into the respective feedback and takes the corrective/improvised action.

7.3.3. Corrective Measures and Implementation Followed [5]

In the past, based on feedback mechanisms, following actions were taken at the deptt level, in addition to individual corrections done by teachers in their courses.
1. Improvement in lesson plan
2. Introduction of practical courses in MTech scheme

7.4. Self-learning beyond syllabus and outreach activities [15]

- Industry expert talks are arranged regularly on different topics on advances in technology

- o **In 2013, different talks were arranged on Cloud computiong and Hadoop, Meta-Language for Design, Future of Internet, Advanced Compiler Techniques, delivered by industry and external academic experts.**

- **Workshops are arranged on different topics**

    - o **In 2012, students participated in the distance education workshop on "Database Management Systems" conducted by IIT Bombay**

    - o **In 2013, in association with ACM chapter, a workshop on "Business Analytics" was aranged**

- **Industry webinars are aranged in the department**

- **Online availabilty of NPTEL videos on institute server**

7.4.1. Scope for self-learning (5)

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

- **Industry webinars are aranged in the department**

- **Online availabilty of NPTEL videos on institute server**

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

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

Online availabilty of NPTEL videos on institute server

7.4.3. 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.)

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

8.1. Campus Infrastructure and Facility (10)

8.1.A   Campus

New 1000 Seat Boys Hostel

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

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

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

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

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

Institute is gearing 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.

8.1.B Administration

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

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

8.1.C Academic Programmes

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

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

Institute has 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	9	3508	2986
Hostel for Girls	2	522	555

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

8.1.3..A Electricity:

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

The entire Electrical Installation is maintained in house under the supervision of

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

8.1.3.B Water Supply Details:

The college campus gets its water supply from Nagpur Municipal Corporation as well as from it's own wells. To ensure regular and uninterrupted supply to all 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)

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

(A) **Board of Governors**

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

(B) **Senate**

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

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

	VNIT, Nagpur	
30	Dr. P. M. Padole, Professor of Mechanical Engg., VNIT, Nagpur	Member
31	Dr. A. M. Kuthe, Professor of Mechanical Engg., VNIT, Nagpur	Member
32	Dr. S. G. Sapate, Head, Deptt. of Met. & Mat. Engg., VNIT, Nagpur	Member
33	Dr. R. K. Paretkar, Professor of Met. & Mat. Engg., VNIT, Nagpur	Member
34	Dr. S. U. Pathak, Professor of Met. & Mat. Engg., VNIT, Nagpur	Member
35	Dr. D. R. Peshwe, Professor of Met. & Mat. Engg., VNIT, Nagpur	Member
36	Dr. R. R. Yerpude, Head, Deptt. of Mining Engg., VNIT, Nagpur	Member
37	Prof. S. Shringarputale, Professor of Mining Engg., VNIT, Nagpur	Member
38	Ms. Alpana Dongre, Head, Deptt. of Architecture, VNIT, Nagpur	Member
39	Dr. V. S. Adane, Professor of Architecture, VNIT, Nagpur	Member
40	Dr. (Mrs.) Sujata Patrikar, Head, Deptt. of Appl. Physics, VNIT, Nagpur	Member
41	Dr. V. K. Deshpande, Professor of Applied Physics, VNIT, Nagpur	Member
42	Dr. (Mrs.) Anupama Kumar, Head, Deptt. of Chemistry, VNIT, Nagpur	Member
43	Dr. S. S. Umare, Professor of Chemistry, VNIT, Nagpur	Member
44	Dr. G. P. Singh, Head, Deptt. of Mathematics, VNIT, Nagpur	Member
45	Dr. (Ms) M. Ghoshal, Head, Deptt. of Humanities, VNIT, Nagpur	Member
46	Dr. S. B. Thombre, Professor of Mech. Engg & i/c T&P, VNIT, Nagpur	Member

47	Dr. D. H. Lataye, Chief Warden, VNIT, Nagpur	Member
48.	Dr. B. M. Ganveer, Registrar, VNIT, Nagpur	Secretary

(C) **Finance Committee**

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

(D) **Building & Works Committee**

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

	NAGPUR – 440001	
9.	**Supdt. Engineer (Electrical),** Public Works Department, NAGPUR – 440001	Member
10.	**Dr. B. M. Ganveer** Registrar, VNIT, Nagpur	Member-Secretary

Other information is as under -

Statutory Committees -

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

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

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

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

1) Special Cell : To ascertain the Goal reservation policy is observed scrupulously. No meeting of Special Cell held during current year i.e. 2013.

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

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

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

   No meeting was held during current year 2013.

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

   Two meetings held during 2013.

84

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

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

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

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

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

LIST OF DELEGATION OF FINANCIAL POWERS

Sr.No.	Particulars	Functionaries	Proposed Financial Power
01.	All kinds of expenditure under plan and non plan budget	Director	Up to 8 Crores
02.	All kinds of expenditure under plan and non plan budget	Deputy Director	Upto 50 Lakhs
03.	All kinds of purchases & other expenditure from Sponsor Research, Projects, Schemes and Consultancy Funds	Dean (R&C)	Upto 10 Lakhs
04.	For Purchase of Consumables from Projects, Schemes and Consultancy Fund	Principal Investigator	Upto 2 Lakhs (for Consumables only)
05.	1. Stores, spares, accessories under allotted operating grant (Non Plan) 2. Purchases under allotted Plan Grant,	Heads of Deptts. Prof-in-Charge (T&P), Librarian	Upto 2 Lakhs

06.	All Expenditure related to student's activities, including sports.	Dean (St. Welfare)	Upto 2 Lakhs
07.	Purchases, Payments of scholarship & other allied expenditure within approved & allotted grant of the year. All related expenditure of PG students & research scholars within approved budget.	Dean (Academics)	Upto 10 Lakhs
08.	Expenditure related to their operational expenses (Office, small equipment, consumables etc.	All Deans	Upto Rs. 2 Lakhs
09.	Expenditure for campus development, minor repairs, cleaning, minor repair of roads, parks, convocation and miscellaneous for which the administrative approval is accorded and fund is allotted for the purpose.	Dean (P&D)	Upto Rs. 2 Lakhs
10.	Purchases of Journals, consumables, spares and accessories etc. form budgetary allocation of the year	Chairman, Library Committee	Upto Rs. 2 Lakhs
11.	Expenditure for medicine/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 for departments not covered above within allotted grant of the year.	Registrar	Full power of [i] and Upto Rs. 2 Lakh
13.	For contingency expenditure	Dy. Registrar, Ass. Registrar (Independent Charges)	Up to Rs. 10000

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

Deans

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

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

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

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

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

All relevant information are made available through website.
Information is made available through emails and circulars.
The RTI Cell is constituted in accordance with the provisions of Right to Information Act, 2005 as follows-
Public Information Officer   --   Dr. B. M. Ganveer, Registrar
First Appellate Authority   --   Dr. S. R. Sathe, Dean, (P&D)
Second Appellate Authority --   Dr. N. S. Choudhary, Director

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

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

In Rupees

Item	Budgeted in CFY (2013-14)	Expenses in CFY (till 30-09-2013)	Expenses in (2012-13)	Expenses in (2011-12)
Infrastructural built-up	2,65,54,000	36,13,35,022	2,81,64,291	15,95,93,770
Library	1,50,00,000	36,13,208	1,90,18,807	1,29,71,122
Laboratory	7,40,50,000	1,72,15,522	4,32,85,956	3,99,33,386

equipment				
Laboratory consumables	9,00,000	3,28,380	34,54,624	14,68,336
Teaching and non teaching staff salary	18,68,00,000	24,03,26,847	44,34,60,400	30,58,08,851
R&D				
Training & travel	3,00,000	8,25,317	11,52,857	12,93,657
Other, specify	2,76,52,000	3,35,20,388	7,88,07,806	6,16,68,294
Total	30,47,02,000	65,71,64,684	61,7340,741	58,27,37,416

8.3.1. Adequacy of budget allocation (4)

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

The Institute receives grant-in-aid from the Government of India based on the budget formulated by it. There is enough 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 utilization of allocated fund is satisfactory as can be seen from above table no. 8.3.

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

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

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

8.4. Programme Specific Budget Allocation, Utilisation (10)

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

Item	Budgeted in CFY	Actual Expenses in CFY (till…) *	Budgeted in CFYm1	Actual Expenses in CFYm1 *	Budgeted in CFYm1	Actual Expenses in CFYm1
Laboratory equipment	4500000	556534		2975864		
Software				900000		
R&D						
Laboratory consumables				26868		
Maintenance and spares						
Training & travel						
Miscellaneous expenses for academic activities	1050000	173534		600736		
Non-plan		30164		135317		
Total	**5550000**	**760232**	**3000000**	**4638785**		

*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 Institutionla Income Expenditure statement in Part I - item I-   10.
(Instruction: The preceding list of items is not exhaustive. One may add other relevant items if applicable.)

8.4.1. Adequacy of budget allocation (5)
(Instruction: Here the institution needs to justify that the budget allocated over the years was adequate.)

8.4.2. Utilisation of allocated funds (5)

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

The utilization of allocated fund is satisfactory as can be seen from above table no. 8.4.

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,
timings = 8:30 a.m. to 9:30 p.m.
Number of library staff = 23 (08 permanent)
Number of library staff with degree in Library Management = 21,
Computerisation for search = 21
indexing, issue/return records Bar coding used = yes
Library services on Internet/Intranet INDEST or other similar membership Archives

8.5.2. Titles and volumes per title (4)

	Number of new titles added	Number of new editions added	Number of new volumes added
CAYm2 2010-11	950	4,365	1,08,694
CAYm1 2011-12	2,226	4,034	1,13,806
CAYm 2012-13	1060	6,049	1,27,383

SUBJECT WISE TITLES (TILL 31ST MARCH 2011)

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

SUBJECT WISE TITLE (TILL 31ST MARCH 2012)

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

SUBJECT WISE TITLES (TILL 31ST MARCH 2013)

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

8.5.3. Scholarly journal subscription (3)

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

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

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

8.5.4. Digital Library (3)

Availability of digital library contents: Available

If available, then mention number of courses, number of e-
books, etc. Availability of an exclusive server: Yes
Availability over Intranet/Internet: Yes
Availability of exclusive space/room: Yes
Number of users per day: (1) Issue counter 512 (2) Reference section 245 (3)
Periodical section 167 (4) Reading Room section 468 (5) Stock Room section 182 (6)
Reprography section 376 (7) CD-ROM use 098

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

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

**<u>Virtual Class Room:</u>**

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
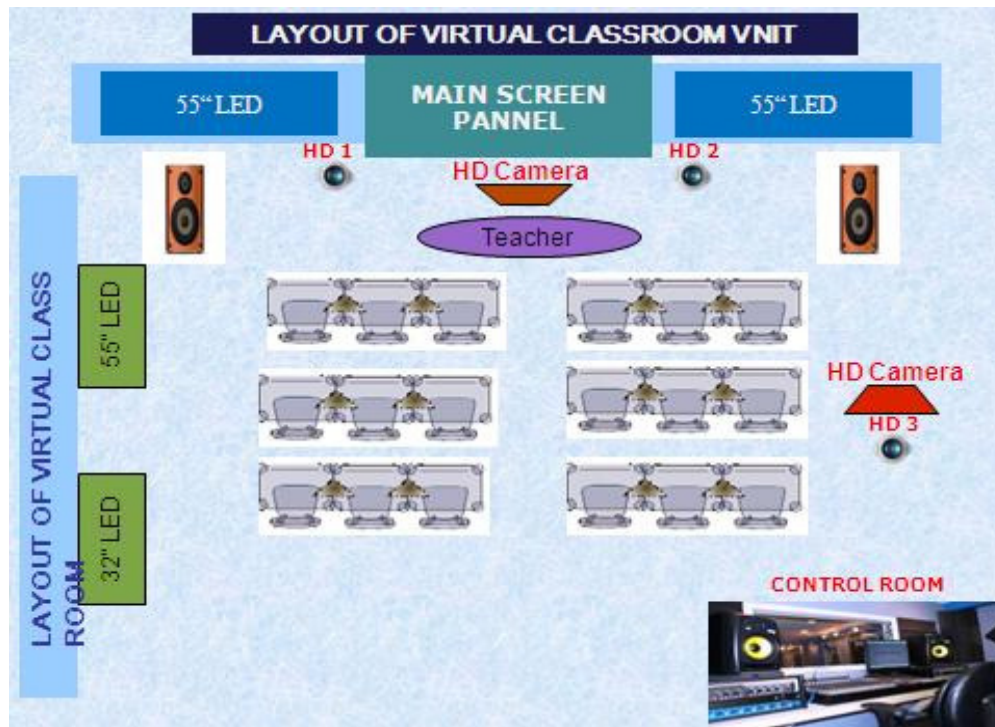
8.6. Incubation facility 5)

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

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.

94

- 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
Available bandwidth: Broadband
Access speed: Gbps and 16 Mbps: Good Access Speed
Availability of Internet in an exclusive lab: Yes
Availability in most computing labs: Yes
Availability in departments and other units: Yes
Availability in faculty rooms: Yes
Institute's own e-mail facility to faculty/students: Yes
Security/privacy to e-mail/Internet users: Yes
(Instruction: The institute may report the availability of Internet in the campus and its quality of service.)

8.7.1 Network Center Information;-

Network Center provides a variety of Services. Network Center administers and manages the entire Campus Computer Network which includes departments, sections computer center, administrative building, library, Guest house, health center, NCC Sectin and Auditorum along with Network   Center and quarters.

Network Center has three leased line (LL) connections 10 Mbps 75 Mbps and 42 Mbps which is distributed all over campus like departments, sections, computer center, administrative building. Guest house, health center, NCC Section, Auditorium and quarters   along   with Network Center, Currently NKN LL provided by NMEICT for Internet is 50 Mbps. Network Centre monitors bandwidth usage continuously and any problems in usage are rectified with the help of ISP (Internet Service Provicer)

Network Center has in-house web server, mail server, proxies and application server along with oracle server. We provide Web-based Email open source that enables all the users to assess their mailbox from anywhere   (inside   or outside VNIT Nagpur) via the   Internet, an institute wide. We mostly encourage use of free and open software like GNU/Linux distributions.

Network Center provides advanced and special purpose softwares such as ANSYS, MATLAB, EXATA and AUTOCAD as well as NPTEL Videos for all the inside users in campus. Microsoft OS Software License for servers. Network Center also host mirrors of   freeware softwares   for all campus users. The documentation is

also provided for special purpose software regarding installation on end user computer. Powerlingo language software is available for the benefit of students.

 The centralized installation of quick Heal Antivirus software is provided for all campus users.

Network center has hardware such as core switch, blade 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 Processor.

The approximate cost of hardware is around 1 crore 60 lakhs only (Rs. 1,60,00,000/-) The approximate cost of software is rupees Two Lakh eighty thousand only (Rs. 280000/-) Computer Hardware AMC is outsourced. The cost of annual maintenance charges on computer hardware is approximately two lakhs (Rs. 2,00,000)
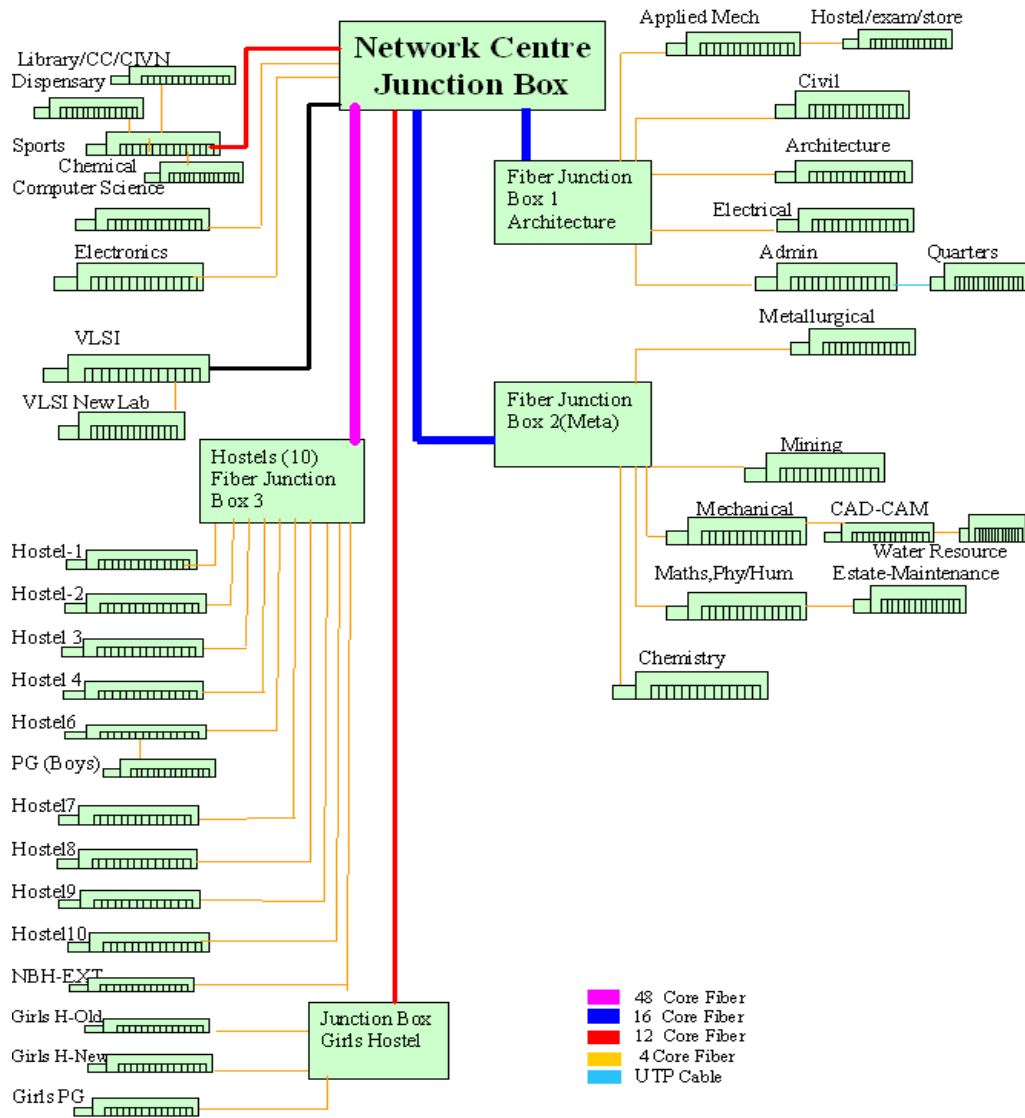
 The annual charges of Reliance LL is approximately twenty five lakhs (Rs. 25,00,000) and that of BSNL LL is around ten lakhs (Rs. 10,00,000/-)

 Network Center has one permanent staff and three adhoc staff - 11 and recurring charges is as under –

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

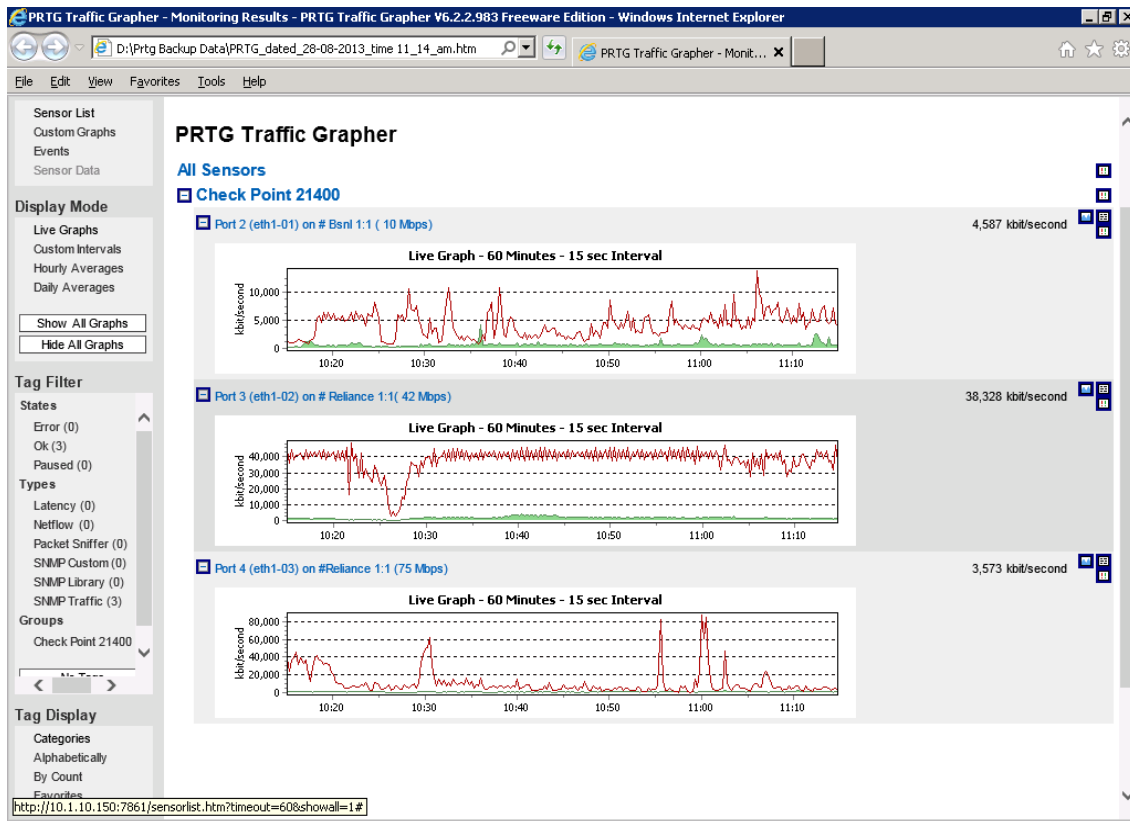**8.7.2 Physical Layout of Fiber Optic Cable of VNIT**

Figure I

Physical Layout of Fiber Optic Cable of VNIT

8.7.3   PRTG Traffic Grapher

Figure II

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

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

Fire Fighting Measures:

1] We have fire extinguishers (mega mess, hostel blocks, in CAD/CAM, Department, some are still in propose)

2] As per chief advisor of fire audit committee S.T. Chaudhari's advice we have DCP, CO2 pressure extinguishers are placed (fire hydride system is not there)

3] Emergency safety arrangements : No

4] Multiple exits and ventilation/exhausts in auditorium and large labs/classrooms: Yes

5] A number of fire extinguishers are located at various sensitive locations throughout the campus. A total of 16 stations containing different types of Fire fighting media such as Foam, Coz, W/C and DCP are functional and under continuous surveillance for dealing with any fire related emergency.

8.8.3. Safety of civil structure (1)

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

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

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

Date : 10/07/2013   sd/-

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

8.8.4. 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:**

<u>Availability of medical care and emergency, first-aid facility</u>:

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

Holistic health services available at health centre include family physician, counsellors, lady doctor, Paediatrician & dental services. Alternative health services like Homeopathy & yoga are 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. Availability of dietician addresses menu planning for balanced diet in the mess besides giving dietary advice for modern epidemic of obesity, diabetes & cardiovascular problem. First aid facility is provided at all hostels.

8.9.2 Physical Education facilities:

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

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

Participation of students in different games

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

Krik Mania:

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

Intramural and Krida Diwas:

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

Medical examination:

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

Physical Efficiency Test:

Compulsory for every first year B. Tech./B.Arch. Components of physical fitness such as abdominal strength, respiratory endurance,

flexibility of hip joint and hamstring muscles and speed are measured by applying suitable   tests of fitness.

Felicitation of the students:

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

Sports facilities currently available on the Campus

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

Planned Sports Infrastructure in near future:

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

****

9. Continuous Improvement (75)

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

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

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

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

9.1. Improvement in Success Index of Students (5)

From 4. 2

Items	LYG	LYGm1	LYGm2	Assessment
Success Index	0.9	0.85	0.85	4

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

From 4. 3

Items	LYG	LYGm1	LYGm2	Assessment
API	8.03	7.89	7.73	8

9.3. Improvement in Student-Teacher Ratio

(5) From 5.1

Items	LYG	LYGm1	LYGm2	Assessment (Average for past 3 years)
STR	20.24	24.35	21.31	22

9.4.Enhancement of Faculty Qualification Index (5) From 5.3

Items	LYG	LYGm1	LYGm2	Assessment (Average for past 3 years)
FQI	6.1	5.2	5.4	6

103

9.5. Improvement in Faculty Research Publications, R&D Work and Consultancy Work (10) From 5.7 and 5.9

Items	LYG	LYGm1	LYGm2	Assessment (Average for past 3 years)
FRP	3.3	3.6	3.6	4
FRDC	1.6	1.8	1.8	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.
Effective Teaching/Learning of Computer Programming	IIT Bombay	Organized by R B Keskar	2 weeks (28th June – 10 July 2010)	Dr. D. B. Phatak (Chief coordinator and teaching faculty)	Teachers in Engg colleges in and around Nagpur	
10 days Workshop on "Database Management Systems"	IIT Bombay	Organized by Mrs. D.D. Shrimankar	13th Dec 2010 to 23rd Dec 2010	IIT Bombay Dr. S. Sudarshan	60	http://ekalavya. it. iitb.ac.in/EOutreachEventContent.do?categorycode=5&&itemcode=500000

Web Technology course as open course	Designed by Mrs. S.A. Raut	For one semester	UG students mostly 2nd Year of all branches	

9.7.New Facility Created (15)

- Cloud Computing Infrastructure was created in odd semester of 2013 by Dr. U. A. Deshpande (jointly with Prof. M. P. Kurhekar, Prof. R. B. Keskar, and Prof. M. A. Radke)

- Parallel Computing Laboratory - set and developed in 2012 by Mrs. D.D. Shrimankar & Dr. S.R. Sathe.

  Usage – Research work   for MTech students and Ph.D Scholars

  Following Purchase Made for Parallel Computing Laboratory. (Approximate Cost: 20 Lach)

Sr.No	Equipment	Quantity
1	HP Z 600 Workstation	02
2	Dell Make Workstation	02
3	Dell Make Server with Rack	02
4	HP Laser Jet Printer	02
5	HP Colour Laser Printer	01
6	Furniture (Chairs)	30
7	LAN cabling	
8	Miscellaneous- 　1. Notice Boards 　2. Carpet/Curtains	

105

- Computer Network Laboratory – set and developed in 2013 by Mrs. D.D. Shrimankar & Dr. S.R. Sathe.

  Usage – Practical class for B.Tech Students, Research in Computer Network, Wireless Networks, Sensor Networks

  Following Purchase Made for Computer Network Laboratory. (Approximate Cost: 25 Lach)

Sr.No	Equipment	Quantity
1	Cisco SG300-28 Layer-2 Switch	05
2	Cisco SG500-28 Layer-3 Switch	05
3	Cisco Router 1921-9	05
4	LAN Trainer Kit	01
5	GSM Trainer Kit	01
6	Dell Make Desktop Computer	06
7	HP Make Laptop	06
8	Furniture (Tables)	15
9	Furniture (Chairs)	30
10	Electric Fitting	
	Power Board	15
	Switch/Socket Board	30
11	Miscellaneous-	
	1. Notice Boards	
	2. Curtain/CarpetEtc.	

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

Specify the overall improvement:

Specify the strength / weakness	Improvement brought in	Contributed by	List of PO(s), which are strengthened	Comments, if any
CAY Strengths – Undergraduate Teaching Weaknesses – Research Publications, Consultancy Work, Sponsored Research Projects	Research Publications, Consultancy Work, Sponsored Research Projects	S. R. Sathe, P. S. Deshpande, U. A. Deshpande, M. P. Kurhekar, R. B. Keskar, M. A. Radke, D. D. Shrimankar, S. A. Raut	6, 7, 8, 9	
CAYm1 Strengths – Undergraduate Teaching Weaknesses – Research Publications, Consultancy Work, Sponsored Research Projects	Research Publications	S. R. Sathe, P. S. Deshpande, U. A. Deshpande, M. P. Kurhekar, D. D. Shrimankar, S. A. Raut		
CAYm2 Strengths – Undergraduate Teaching Weaknesses – Research Publications, Consultancy Work, Sponsored Research Projects	Research Publications	S. R. Sathe, P. S. Deshpande, U. A. Deshpande, M. P. Kurhekar, D. D. Shrimankar, S. A. Raut		

Declaration

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

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

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

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

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

I undertake that the institution shall co-operate with 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 of 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 by them.

Place: Signature, Name, and Designation of the
Date: Head of the Institution with seal

APPENDIX –A
Course Code and Title
CSP541 : Software Lab - I

1. **Course Description**

   Understanding Linux operating system. Getting insight into object oriented programming, advanced data structures and web programming.

   1 practical slot (2 hrs), per week.

   Credit scheme - (L-T-P-C: 0-0-2-2)

2. **Required Background or Pre-requisite:**

3. **Detailed Description of the Course**
   This lab course prepares students for understanding Linux operating system environment. It also teaches them advanced data structures and object oriented programming in Java and C++ languages. Exercises also include programming for web using languages like HTML, XML, and Python. Network monitoring tools are also introduced.

   Typical Laboratory Experiments:

   1. Unix/Linux Lab – 1

      a. Common Commands – ls, passwd, wc, chdir, mkdir, chmod, cd, mv, df, du, netstat, ps, more, set, env, setenv, chgrp, man, rm, rmdir, grep, vi, tar, untar, uuencode, find, cat, history, ping, ifconfig, traceroute, cksum, cmp, ln, lynx, gzip, gunzip

      b. Piping and redirection

      c. Editing, Scripting and Pattern Matching – vi, emacs, awk, sed, bash script – variables, conditionals, and loops

      d. Parameter passing to C program from shell (argc / argv)

      e. Introduction to using different tools for identification of possible errors in C program – gdb, concepts of "core dump", backtracing using "bt", using "info" to dump all registers, creating watch-list / watch variables.

      f. DDD (Data Display Debugger) – introduction and usage

   2. Web Technologies and Networking Lab

      a. Creating your own homepage

      b. HTML, XML, XSD and HTML / XML parsing

    c.   J2EE/.Net introduction: Using Eclipse and VisualStudio to create webpages

    d.   JavaScript and JavaScript debugging

    e.   PHP/Perl/Python/Ruby scripting

    f.   Networking Commands – inetd, host, ifconfig, netstat, nslookup, ping, ssh, traceroute

    g.   Network Monitoring tools – Nagios, Wireshark, OpenNMS

3.   Advanced Programming and Data Structures Lab – I

    a.   Arrays: Searching, Sorting, 2D/3D arrays

    b.   Functions: Pass-by-Value, Pass-by-Reference, Recurrence Functions

    c.   Generating permutation/combinations, Generating truth-table for a logical formula

4.   Object Oriented Lab

    a.   OO Concepts – Classes, Objects, Inheritance, Overloading

    b.   Exceptions and Error Handing

    c.   Threading and Synchronization in Java/C++

    d.   UML and Design Patterns

    e.   Profilers –static and dynamic profiling, Code coverage tools, memory leak tools and usage

4. Text books and/or other required material:
- Head First Java, 2nd Editionby Kathy Sierra, Bert Bates, Publisher: O'Reilly Media
- Linux in a Nutshell, 6th EditionBy Ellen Siever, Stephen Figgins, Robert Love, Arnold RobbinsPublisher: O'Reilly Media

5. Course Objectives

- The students should in-depth understanding of the Linux operating system and reveals critical commands and options of using the Linux for any application.
- To understand application development, debugging and code management under Linux platform.
- Learn how to develop for and port applications to the Linux environment. Get to know the necessary tools for Linux application development and learn about special features offered by Linux.

- To inform students about various elements that make the web work, and the way they relate to PHP, Python, HTML, XML and JavaScript. The three after this one are more practical, and show some of the ways that can be used to inspect and change a web form and a web-page.
- To substantially strengthen students' programming ability by requiring them to program a number of large, interesting problems.
- To improve students understanding of object-oriented principles.
- To provide exposure to a broad range of programming areas including multi-threaded programs, communication between processes, and interacting with databases.
- To provide team programming experience.

6. Laboratory Schedule

Lab: One 2-hr session per week

7. Contribution of Course to Professional Component
Lab: Students learn to program and use Linux operating system. They understand object oriented programming and web based programming. They also learn about advanced data structures.

8. Evaluation of Students
The instructor uses the following methods: several lab projects, and one-on-one discussions during office hours.

9. Relationship of Course Objectives to Program outcomes
The correlation of the COs of the course Software Lab-Iand the POs are shown in the following table. A 'H', 'M', or 'L' mark on a cell indicates whether the COs have a 'high', 'medium', or 'low' correlation with the corresponding PO on the column. A blank cell indicates that there is no correlation between the COs to a particular PO.

Correlation of COs of Software Lab-I

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
H	L	H				L		H		H	L

Course Code and Title
CSP529 : Technical Writing and Publishing

1. **Course Description**

   Understanding and using English language for communication, documentation and presentation.

   1 practical slot (2 hrs), per week.

   Credit scheme - (L-T-P-C: 0-0-2-2)

2. **Required Background or Pre-requisite:**

3. **Detailed Description of the Course**

   Understanding and using English language for communication, documentation and presentation. Using Document management tools. Gaining expertise on Microsoft Office tools like Word, Excel and PowerPoint. Using Linux and Latex for creating documents for sharing. Summarizing, Abstracting and Elucidating technical documentation. Understanding paper reading, paper reviewing and paper publishing.

   Typical Laboratory Experiments:

   - Presenting a book chapter using powerpoint slides

   - Data Analysis: Maintaining multiple results obtained over time and reporting them using charts and graphs

   - Technical Documentation – Requirement/specification documentation, Design documentation, Test-cases documentation, Use-cases documentation

   - Writing an installation/instruction manual

   - Writing an abstract of a technical article – summarizing an article in 300 words

   - Summarizing 3 papers into a report and its presentation

4. **Text books and/or other required material:**
   - Strunk and White : The Elements of Style

   - Gretchen Hargis et. al. : Developing Quality Technical Information: A Handbook for Writers and Editors, Second Edition, IBM, 2004.

   - Leslie Lamport : LaTex

5. **Course Objectives**

- To inform students about writing by engineers and computer scientists, to engineers, engineering managers, and technical writers.
- Assignments and projects include job application and resume, in-code documentation, algorithm description, survey article, proposal, progress report, formal technical report, summarization and oral presentation.
- Students would be able to effectively use Google search, understand and use manuals, create installation/instruction manuals, understand the standards and RFC's, and Present a book chapter using powerpoint slides

6. **Laboratory Schedule**

Lab: One 2-hr session per week

7. **Contribution of Course to Professional Component**

Lab: Students learn to communicate effectively using different platform.

8. **Evaluation of Students**
The instructor uses the following methods: several lab projects, and one-on-one discussions during office hours.

9. **Relationship of Course Objectives to Program outcomes**

The correlation of the COs of the course Technical Writing and Publishing and the POs are shown in the following table. A 'H', 'M', or 'L' mark on a cell indicates whether the COs have a 'high', 'medium', or 'low' correlation with the corresponding PO on the column. A blank cell indicates that there is no correlation between the COs to a particular PO.

Correlation of COs of Technical Writing and Publishing

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
L					L	L			H		

Course Code and Title
CSL 530 : Topics in Bioinformatics

1. Course Description

The study of computer applications for Biology. This course also talks about different algorithms that are designed for solving biological problems. 3 lectures (3 hrs) per week. Credit scheme - (L-T-P-C: 3-0-0-6)

2. Required Background or Pre-requisite: CSL 313 – Analysis of Algorithms

3. Detailed Description of the Course

- Basics of biology   (1 Week)

- Sequences: Problem statement, Edit distance and substitution matrices, Global and local alignments, Spliced alignment, Space-efficient sequence alignment, Multiple alignment,   (2 Weeks)

- Structures: Protein alignment, Protein structure prediction   (1 Week)

- Phylogenetic trees: Large parsimony and small parsimony problems, Probabilistic approaches, Grammar-based approaches   (1 Weeks)

- Overview of Gene Control, Working of Genetic Switches, Introductory Systems Biology, The biochemical paradigm, genetic paradigm and the systems paradigm
                                                                                              (2 Weeks)

- Building an Organism Starting From a Single Cell -Quorum Sensing – Programmed Population Control by Cell-Cell Communication and Regulated Killing; Gene regulation at a single cell level- Transcription Networks -basic concepts -coherent Feed Forward Loop (FFL) and delay gate -The incoherent FFL -Temporal order, Signaling networks and neuron circuits -Aspects of multi-stability in gene networks.

                                                                                              (3 Weeks)

- Modeling biological systems, Hidden Markov models   (2 Weeks)

- Miscellaneous topics: Pathways and networks, Microarrays, Biomedical images, Genetic Algorithms and applications,   (2 weeks)

4. Text books and/or other required material:

- "An Introduction to Bioinformatics Algorithms" by Jones, Pevzner. MIT Press.

- "Algorithms on Strings, Trees and Sequences" by Gusfield. Cambridge University Press.

- "An Introduction to Systems Biology: Design Principles of Biological Circuits" by Alon. Chapman & Hall/CRC Press.

5. **Course Objectives**

- This course introduces students to the basic computational methods and algorithms that can be used to understand the cell on a molecular level and biological system at a macro level.

- Students will know algorithms and programming techniques like dynamic programming, hashing, and suffix trees.

- The course focuses on computational approaches to: genetic and physical mapping; genome sequencing, assembly, and annotation; protein structure and folding; and molecular dynamics.

- This course will help students develop multidisciplinary approach to the systematic analysis and modeling of complex biological phenomena.

- Serving as an introduction to computational and systems biology, this course emphasizes the fundamentals of nucleic acid and protein sequence analysis, structural analysis, and the analysis of complex biological systems.

- Students are also exposed to currently emerging research areas in the fields of computational and systems biology.

6. **Class Schedule**

Lectures : 3 1-hr lectures per week

7. **Contribution of Course to Professional Component**

Lecture: Students learn about computational methods and algorithms in bioinformatics and systems biology. They are also exposed to current emerging research areas in these fields.

8. **Evaluation of Students**
The instructor uses the following methods: 2 sessional exams, end-semester exam, class test and assignments, one-on-one discussions during office hours.

9. **Relationship of Course Objectives to Program outcomes**

The correlation of the COs of the course "Topics in Bioinformatics"and the POs are shown in the following table. A 'H', 'M', or 'L' mark on a cell indicates whether the COs have a 'high', 'medium', or 'low' correlation with the corresponding PO on the column. A blank cell indicates that there is no correlation between the COs to a particular PO.

Correlation of COs of Topics in Bioinformatics

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
L	H	H	H	L		H	H	H		L	L

Course Code and Title
CSL516 : Soft Computing Techniques

1. **Course Description**

This course provides an introduction to the basic concepts of Soft Computing methodology and covers three main components - Neural Networks, Fuzzy Logic and Evolutionary Computation. The course combines theoretical foundations with practical applications using different tools and techniques.

Topics include Neural Networks, Fuzzy Logic, Evolutionary Computation and Recent developments and applications of Soft Computing in various areas.
Three lectures per week. Credit scheme - (L-T-P-C: 3-0-0-6)

2. **Required Background or Pre-requisite**

3. **Detailed Description of the course**

- Overview of course and Basic of Soft Computing   (1 Week)

- Introduction of Neural Networks   (1 Week)

- Learning Process and Learning Task   (1 Week)

- Supervised Learning – Single and Multi Layer Network   (2 Weeks)

- Associative Memory   (1 Week)

- Self organizing Maps   (1 Week)

- Neuro-Dynamics, Hopfield Network   (1 Week)

- Fuzzy Logic and Systems-Fuzzy Sets and Membership Functions, Operations on Fuzzy Sets, Fuzzification.   (1 Week)

- Fuzzy Numbers- Uncertain Fuzzy Values, Fuzzy Numbers and its L-R representation, Operations on Fuzzy Numbers.   (1 Week)

- Fuzzy Relations   (1 Week)

- Fuzzy Inference Systems- Architecture of Fuzzy Inference System, Fuzzy Inference Rules and Reasoning, Defuzzification.   (1 Week)

- Applications of Fuzzy Logic   (1 Week)

- Genetic algorithms and evolutionary computation.   (1 Week)

- Applications of Genetic Algorithms & Hybrid Systems   (1 Week)

4. Text books and/or other required material
- Soft Computing and Its Applications : R.A. Aliev, R.R. Aliev
- Neuro-Fuzzy and Soft Computing: A computational Approach to Learning & Machine Intelligence; Roger Jang, Tsai Sun, Eiji Mizutani, PHI.
- Neural Network: A Comprehensive Foundation; Simon Haykin, PHI.
- Elements of artificial Neural Networks; Kishan Mehtrotra, S. Ranka, Penram International Publishing (India).
- Fuzzy Logic with Engineering Applications; Timothy Ross, McGraw-Hill.
- Neural Networks and Fuzzy Systems: Bar Kosko, PHI.

5. Course Objectives
- To familiarize with neural networks and learning methods for neural networks;
- To introduce basics of genetic algorithms and their applications in optimization and planning;
- To introduce the ideas of fuzzy sets, fuzzy logic and fuzzy inference system;
- To introduce students tools and techniques of Soft Computing;
- To develop skills thorough understanding of the theoretical and practical aspects of Soft Computing.

6. Class Schedule
Lecture: Three 1-hour lectures per week

7. Contribution of Course to Professional Component
- Understand the need for Soft Computing;
- Understand different uses of Soft Computing in various areas;
- Understand the steps involved in the development of Soft Computing;
- Acquire a working knowledge of some popular tools for Soft Computing;
- Design, implement and verify computing systems by using appropriate Soft Computing techniques and tools

8. Evaluation of students
The instructor uses the following methods: Two sessional exams, one end-semester examination and programming assignments.

9. Relationship of Course Objectives to Program Outcomes
Correlation of COs of Soft Computing Techniques

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
H	H			H		M	M	H	L	L	

Course Code and Title

CSL519 : Distributed Systems

1. **Course Description**

   The study of basic techniques in the design and development of Distributed Systems and understanding solutions of the fundamental problems in distributed systems like mutual exclusion, deadlock detection, termination detection, leader election, fault tolerance, etc.

   3 lectures per week.   Credit scheme - (L-T-P-C: 3-0-2-8)

2. **Required Background or Pre-requisite:** Operating Systems Course

3. **Detailed Description of the Course**

- Introduction and motivation to Distributed Systems,Characteristics, Applications, Challenges, Architecture types, Fundamental models.   (2 weeks)
- Inter-process and inter-node communication using Sockets – connection oriented and connection-less, Remote Procedure Calls, Remote Method Invocation   (1 week)
- Distributed File System Design and Implementation, Case Studies of NFS, Andrew File Systems, HDFS, Distributed Resource Management.   (1 week)
- Clock Synchronization Techniques, Network Time Protocol, Logical Clocks, Vector Clocks.   (1 week)
- Causally Ordered Broadcast and Unicast, Termination Detection – Ring based and Dijkstra Scholten algorithms, Leader Election – Ring based, Franklin's algorithm and Bully Algorithm   (2 weeks)
- Distributed Mutual Exclusion – Token based algorithms – Lamport's, Ricart-Agarwala, Maekawa's algorithms, Non Token based Algorithms – Suzuki Kasami, Raymond's algorithms, comparison of different algorithms.   (2 weeks)

- Distributed Deadlock Detection, Resource and Communication Deadlocks – Centralized technique, Distributed technique - edge chasing and path pushing algorithms, Hierarchical technique, Recovery from Deadlocks.   (1 week)

- Fault Tolerance, Handling Crash faults –Two phase commit protocol, Non-blocking three phase commit protocol, Birman-Joseph Atomic Broadcast Protocol, Voting techniques for fault tolerance, static voting, dynamic voting.   (2 weeks)

- Recovery – forward and backward recovery, undo-redo logs, write-ahead log protocol Coordinated and Uncoordinated Checkpointing and Recovery algos   (1 week)

- Agreement protocols – LSP Oral Messages, Agreement using Signed Messages(1 week)

  Typical Laboratory Experiments : Socket Programming, RPC, Using Sockets to implement a rudimentary Distributed File System, Implementation and Performance Evaluation of any Distributed Mutual Exclucion algorithm.

4. **Text books and/or other required material**

- Singhal and Shivratri, "Advanced concepts in Operating Systems", McGraw Hill
- Coulouris, "Distributed Systems", AWL Press. Pearson Education
- Tanenbaum, "Modern Operating Systems", PHI

5. **Course Objectives**

- Appreciation of the fundamentals, advantages, and challenges in designing and implementing distributed systems.
- Appreciation of the differences in the handling of issues like mutual exclusion, deadlock detection, fault handling, etc. in a centralized system and a distributed system.
- Ability to write distributed programs using sockets, RPC/RMI, etc.
- Ability to make intelligent choices from among available algorithms and techniques for the design of distributed systems subject to specific design and performance constraints.
- Ability to communicate effectively about different design decisions made for distributed system implementations, and their experimentalevaluation.

6. **Class/Laboratory Schedule**

   Lectures : 3 1-hr lectures per week
   Lab: One 2 hr session per week

7. **Contribution of Course to Professional Component**

   Lecture: Students learn about the design and development of distributed systems. They are able to understand the various primitives used in implementing distributed systems and can analyze different algorithms for their implementation.

   Lab: Students learn to implement distributed programs using sockets and RPC/RMI. They understand the issues about scalability by doing performance evaluation of their experiments.

8. **Evaluation of Students**
   The instructor uses the following methods: 2 sessional exams, end-semester exam, a course project, one-on-one discussions during office hours, laboratory experiments and programming assignments.

9. **Relationship of Course Objectives to Program outcomes**

   Correlation of COs of Distributed Systems

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12

Course Code and Title

CSL403 : Advances in Database Management System

1. Course Description

To teach database internals and implementation .

To teach concepts in distributed databases, parallel databases and columnar databases.

 Credit scheme - (L-T-P-C: 3-2-0-8)

2. Required Background or Pre-requisite:
Data structure and algorithm, operating systems,Database Management Systems

3. Detailed Description of the Course

- Introduction:DBMS   (1 week)
- SQL: Overview (1 week)
- Anatomy of DBMS,process,memory and disk structure (1 week)
- ACID properties: Implementation (1 week)
- Concurrency control and Isolation level (1 week)
- Logical and Physical storage (1 week)
- Query optimization (1 week)
- Security and auditing (1 week)
- Materialized Views and Query rewriting (1 week)
- Distributed database model (1 week)
- ACID properties in distributed database (1 week)
- Parallel database architecture (1 week)
- Hadoop Architecture (1 week)
- Columnar databases (1 week)

4. Text books and/or other required material

- Database System Concepts **Sixth Edition**. Avi Silberschatz · Henry F.**Korth** · S. Sudarshan. McGraw-Hill ISBN 0-07-352332-1
- Fundamentals of Database Systems **5th Edition**. Textbook authors: Shamkant B. **Navathe**, Ramez Elmasri Addison-Wesley ISBN: 9780321369574
- **Distributed Databases**. Author, Stefano CERI. Publisher, McGraw-Hill, 1988. ISBN, 0070265119, 9780070265110.

- Principles of Distributed Database Systems 3rd Edition Author **Özsu**, M. Tamer, **Valduriez**, Patrick   Springer
- Readings in Database Systems, Third Edition (The Morgan Kaufmann Series in Data Management Systems) [Paperback]
- Michael Stonebraker (Author), Joseph Hellerstein (Author)
- Oracle 11g Concepts guide
- Oracle 11g Administration Guide
- Oracle 11g Performance and Tuning

5. Lab Experiments

- Advanced SQL queries
- Query optimization
- Establishing distributed environment
- Establishing parallel environment
- Solving problems using Hadoop
- Columnar database installation and experimentation.

6. Course Objectives

Upon successful completion of this course, each student should be able to

- Understand how to optimize database management system.
- Understand how to handle large concurrent operations.
- Understand how to ensure durability of data.
- Understand how to handle distributed database.
- Understand how to design systems for parallel databases.
- Understand new concepts like BIGDATA and columnar databases.

7. Class Schedule

Lecture : Three per week(60min each)

Lab: One per week(120min each)

Contribution of Course to Professional Component

Evaluation of students:

8. Contribution of Course to Professional Component

Lecture: Student learn about database internals, database optimization, distributed and parallel environment and new technologies like Hadoop and columnar databases.

Lab: Student learns about writing advanced queries, query optimization, establishing different environments like parallel and distributed databases.

9. Evaluation of Students

- The instructor evaluates outcomes using the following methods:
- Assignments
- Midterm exams
- Quizzes
- Laboratory assignments
- The student grades are decided based on the following factors:
- Assignment
- Midterm exam
- Final exam
- Lab viva

10. Relationship of Course Objectives to Program outcomes

The correlation of the COs of the course Database Management Systems and the POs are shown in the following table. A 'H', 'M', or 'L' mark on a cell indicates whether the COs have a 'high', 'medium', or 'low' correlation with the corresponding PO on the coloumn. A blank cell inidicates that there is no correlation between the COs to a particular PO.

Correlation of COs of Advanced Database Systems

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
H	H	H	H	M	M	L	H	M	L	L	

Course Code and Title

CSL524 : Real Time Systems

1. **Course Description**
   The study of scheduling algorithms and schedulability tests for different algorithms in the design of Hard Real-Time Systems (RTS). Understanding execution of periodic, sporadic, and aperiodic jobs. Taking into account the issues of resource allocation and overview of features of different commercially available Real Time Operating Systems (RTOS).

   3 lectures per week.   Credit scheme - (L-T-P-C: 3-0-0-6)

2. **Required Background or Pre-requisite:** Operating Systems Course

3. **Detailed Description of the Course**

- Introduction to RTS, WCET notion, Types of RTS, Task Types, Jobs – Periodic, Sporadic, Aperiodic, Applications of RTS, Predictability, Reference Model, Types of schedulers, Cyclic and Priority based Schedulers. (1 week)
- Cyclic, priority based schedulers – static/dynamic – RM, EDF, LST, Optimality of EDF, Non-optimality of EDF, Scheduling with precedence constraints, Multiprocessor scheduling – static and dynamic systems, Problems of Predictability in multi-processor systems, Predictability of preemptive priority based scheduling in uniprocessor systems, Performance Measure of validation techniques. (1 week)
- Cyclic scheduling, frame size constraints, Job Slicing, Aperiodic job scheduling using Slack stealing, Sporadic job scheduling, Practical considerations, Disadv of cyclic scheduling. (2 week)
- Priority Based Sched, Static-Dynamic Systems, Fixed, Variable Priorities, Schedulable Utilization, Schedulable Utilization of EDF, Schedulability Test of EDF, Unpredictability of Dynamic Priority in Overload, Liu-Layland Theorem, Optimality of RM in Simply-Periodic Systems, Concept of Critical Instants, Time Demand Analysis, Practical factors - Non-preemption, self-suspension, context switch time, Limited priority levels, Mapping techniques, Impact on schedulability, Tick Scheduling. (3 week)
- Aperiodic jobs in Priority based systems, Polling Server, Combining with background server,Polling Server Parameters, Deferrable Server (DS), Combining with Background Server, Deferrable Server parameters, Disadv of DS, Simple Sporadic Server Rules, Combining Background time, Proof of Simple Sporadic Server as a periodic task, Constant Utilization Server for Deadline Driven systems, Total Bandwidth Server, Starvation free CU/Background Server, Preemptive Weighted Fair Queuing Server, Scheduling of Sporadic Jobs in Fixed Priority and Dynamic Priority Systems. (3 week)

- Resource Control, Model, Priority Inversion, Uncontrolled Priority Inversion, Anomalies, NPCS, Blocking Time, Disadvantages of NPCS, Priority Inheritance Protocol, Deadlocks due to Priority Inheritance Protocol, Priority Ceiling Protocol, Deadlock Avoidance,Analysis of Priority Ceiling Protocol, Blocking time, context switches, Stack Sharing Priority Ceiling Protocol, example, Priority Ceiling Protocol in Dynamic Priority Systems, Preemption Levels, Fixed Preemption Level Systems like EDF, Basic Preemption Ceiling Protocol, Multiple units of resources, Priority ceiling, Preemption

ceiling and stack based preemption ceiling protocols for multiple unit resources.   (3 week)

4. **Text books and/or other required material**
   - Real-Time Systems :Jane W.S. Liu, Pearson Education
   - Real Time Systems : C.M. Krishna & Kang G. Shin : McGraw Hill

5. **Course Objectives**
   - Appreciation of the need and the challenges in the design of hard and soft real time systems.
   - Understanding the different scheduling techniques and the schedulability criterion.
   - Awareness about issues regarding scheduling of sporadic and aperiodic jobs and their applications, e.g. in messae passing in real-time environments.
   - Appreciation of the need for integrated mechanism for resource allocation and scheduling.
   - Awareness about different RTOSes and their features.
   - Ability to choose a scheduling technique for the design of a real time system.
   - Ability to choose a suitable RTOS for a particular system.

6. **Class Schedule**
   Lectures: 3 1-hr lectures per week

7. **Contribution of Course to Professional Component**

   Lecture: Students learn about designing and developing real-time systems. They are able to analyze the different scheduling approaches and are able to make informed design choices.

8. **Evaluation of Students**
   The instructor uses the following methods: 2 sessional exams, end-semester exam, a course project, and programming assignments.

9. **Relationship of Course Objectives to Program outcomes**

Correlation of COs of Real-Time Systems

PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
H	H	M	M		M	M	M		L	H	M