NATIONAL BOARD OF ACCREDITATION

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

NATIONAL BOARD OF **ACCREDITATION**

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	1965	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	2006	20
14.	Structural Dynamics and Earthquake Engineering	2003	20
15.	Structural Engineering	1991	20
16.	Excavation Engineering	2012	
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	

(Total number of programmes Accredited vide this letter – Twelve and Withdrawn – Two)

New M.Tech Programs started (year)

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

Campus
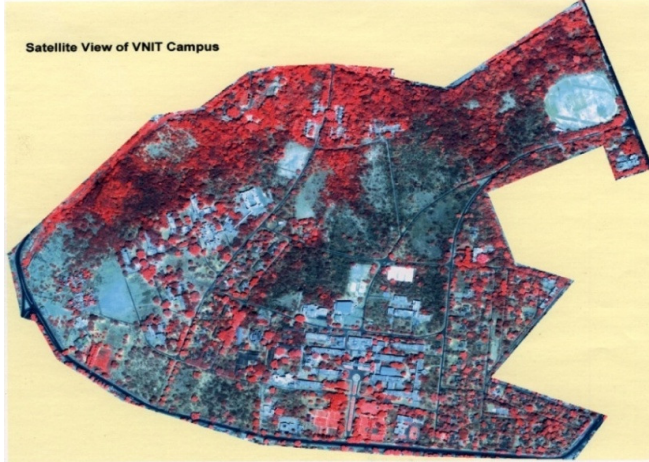
Satellite View of VNIT Campus

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 / requiring intensive care are referred to the Govt. Medical College and Hospital and other Health care centres duly approved under the CGHS. A full time dedicated Ambulance service in available at the dispensary.

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

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

CENTERAL GOVT. MHRD

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

1.5. Mission and Vision of the Institution:

Mission

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

Vision

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

I.6. Organisational Structure:

1.6.1 Administration

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

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

1.6.2 Flow Chart showing Institutional Administration

Figure - 1
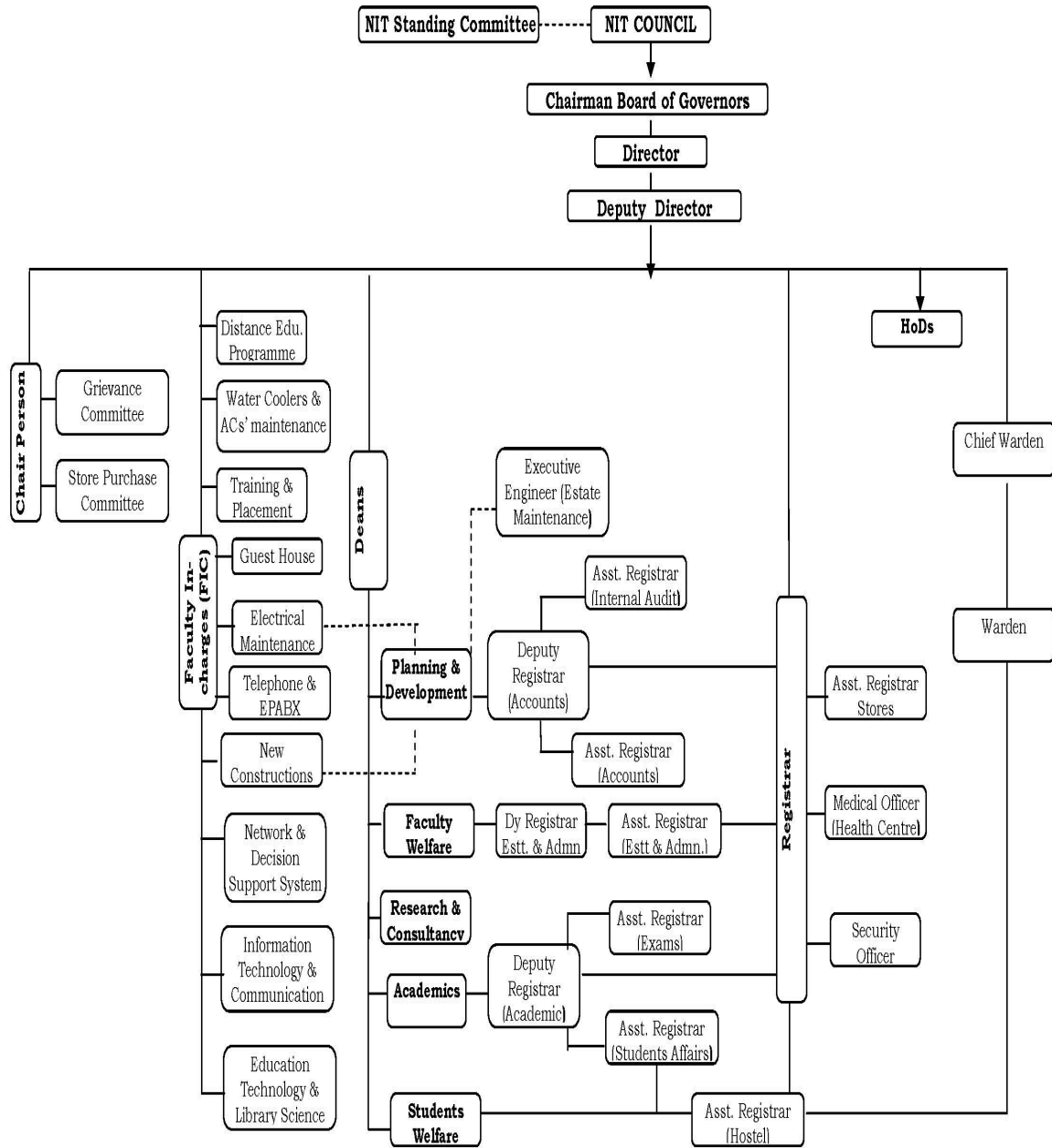
1.6.3 Flow Chart showing the hierarchy of Academic Departments

Figure - 2

1. ACADEMIC DEPARTMENTS

Director → Deputy Director → HODs

Faculty: Professor, Associate Professor, Assistant Professor

Other Staff

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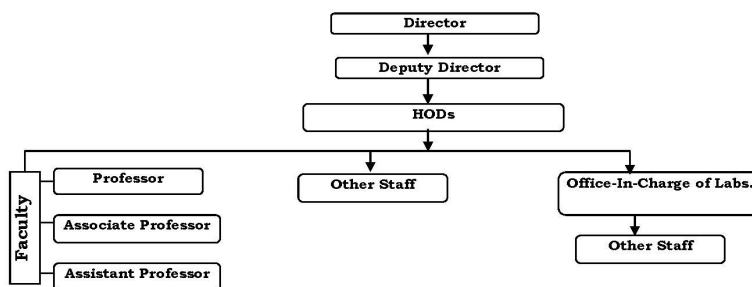
	Reporting Officer	Reviewing Officer
Professor	Director	Director
Associate Professor / Assistant Professor	HoD	Director
Group – A other than above	HoD	Deputy Director/ Director
Group – C/Other Staff	Lab–In-Charge / HoD	HoD

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

Director → Deputy Director

Registrar (Administrative matters), Dean (Academic) (Functional matters)

Deputy Registrar (Academic)

Asst. Registrar (Exam), Asst. Registrar Students Welfare (Acd.)
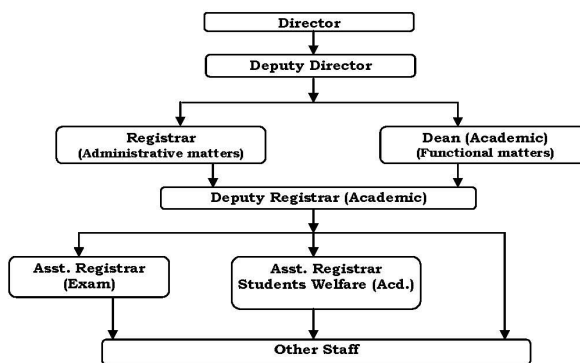
Other Staff

	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

II.1. Name and address of the department:

Department of Computer Science & Engineering, VNIT, Nagpur

II.2. 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

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

Program	Description
UG 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
UG in........	
MCA	
PG 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
UG in	

II.4. 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 the importance of knowledge management.

Mission of the Department

To produce highly qualified and motivated graduates through a rigorous 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 interdisciplinary 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.

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

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

II.6.Total number of students:

UG: 92

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

Items	CAY		CAYm1		CAYm2	
	Min	Max	Min	Max	Min	Max
Teaching Faculty with the Program	13	13	13	13	13	13
Non teaching Staff	7	7	7	7	7	7
Total						

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

Items	Budget in CFY	Actual expenses in CFY *	Budgeted in CFYm1	Actual Expenses in CFYm1 *	Budgeted in CFYm2	Actual Expenses in CFYm2
Laboratory Equipments	45,00,000	5,56,534		29,75,864		
Software purchase				9,00,000		
Laboratory consumables						
Maintenance and spares				26,868		
Travel						
Miscellaneous expenses for academic activities	10,50,000	1,73,534		6,00,736		
(Non-plan)		30,164		1,35,317		
Total	55,50,000	7,60,232	30,00000	46,38,785		

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

III. Programme Specific information

III.1.   Name of the Programme

UG in B.Tech. 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
         B.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:

Program   Description
UG in ....   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 to 2010

III.5.   Deficiencies, weaknesses/concerns from previous accreditations:
         Less faculty Strength
III.6.   Total number of students in the programme:
         UG   : 92
         PG   : 20

III.7.   Minimum and maximum number of staff for the current and three previous

academic years (1st July to 30th June) in the programme:

Items	CAY		CAYm1		CAYm2	
	Min	Max	Min	Max	Min	Max
Teaching Faculty with the Program	13	13	13	13	13	13
Non teaching Staff	7	7	7	7	7	7

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

Items	Budget in CFY	Actual expenses in CFY(till...) *	Budgeted in CFYm1	Actual Expenses in CFYm1 *	Budgeted in CFYm2	Actual Expenses in CFYm2	Budgeted in CFYm2	Actual Expenses in CFYm2
Laboratory Equipments	45,00,000	5,56,534		29,75,864				
Software				9,00,000				
Laboratory consumables								
Maintenance and spares				26,868				
Travel								
Miscellaneous expenses for academic activities	10,50,000	1,73,534		6,00,736				
(Non plan)		30,164		1,35,317				
Total	55,50,000	7,60,232	30,000 00	46,38,785				

PART B

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

1.1. Vision and Mission (5)

1.1.1.   State the Vision and Mission of the institute and department (1)
(List and articulate the vision and mission statements of the institute and department)

Vision 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 propagate 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 of the department from the vision and mission of the institute.)

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 (15)

1.2.1. Describe the Programme Educational Objectives (PEOs) (2)
(List and articulate the programme educational objectives of the programme under accreditation)

1. Achieve the understanding of the basics and emerging techniques of a broad range of computer science and engineering concepts. Gain the ability to analyze and solve computer science and engineering problems through application of fundamental knowledge of maths, science, and engineering.

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 (2)
(Describe in which media (e.g. websites, curricula books) the PEOs 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 (5)
(Describe the process that periodically documents and demonstrates that the PEOs are 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 occasions – 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 occasions – 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 PEOs with the Mission of the institute (5)
(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 propagating engineering knowledge and to provide education with rigorous academics. PEO 2 is consistent with the Mission statement of generating new knowledge and enjoys 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 (30)

1.3.1. Justify the academic factors involved in achievement of the PEOs (15)
(Describe the broad curricular components that contribute towards the attainment of the Programme Educational Objectives.)

1. Different core courses are present in the scheme of B. Tech. in Computer Science and Engineering with which a student is able to get a deep and clear understanding of the basics – e.g. Data Structures and Program Design, Discrete Mathematics, Introduction to Object Oriented Methodology, Theory of Computation 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 three 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. Artificial Intelligence, Topics in Distributed Systems, Data Mining and Warehousing, Information Retrieval, etc.
4. The courses and their syllabi are discussed at length for their revision and upgradation in departmental faculty meetings. The recommendations of the departmental 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 person 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 final year project, which is typically done in a group. In that, the students explore a topic of their interest and to understand the issues and the current work going on in that. The faculty then help them in formulating a problem and the students are encouraged to come out with more such challenging problems. The possible techniques that can be used for solving these problems 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 final year project, the students first prepare a poster in which they specify the problem which they would be tackling and explain some existing techniques. Towards the end of the project, the students are required to write a formal report 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.

7. In the entire curriculum, the students are required to take humanities courses for developing their humanities and social skills.

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

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

1. At the lowest level there are class committees formed for every year i.e. second year, third year, and final year. 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 departmental 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 professors of the department and the HOD represent the views of the department.

5. In addition to this, at least 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 feedbacks regarding those are incorporated.

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

1.4.1. Indicate tools and processes used in assessment of the achievement of the PEOs (25)
Describe the assessment process that periodically documents and demonstrates the degree to which the Programme Educational Objectives are attained. (10)

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 updating of the PEOs.

Include information on: (15)
a) A listing and description of the assessment processes used to gather the data upon which the evaluation of each programme educational objective is based. Examples of data collection processes may include, but are not limited to, employer surveys, graduate surveys, focus groups, industrial advisory committee meetings, or other processes that are relevant and appropriate to the programme;

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.

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

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

Feedback Form for Alumni
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 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.

Part I - Feedback regarding the outcomes

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 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

<div align="center">Part II - Feedback regarding the curriculum</div>

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 evidences for the achievement of the PEOs (15)

      a) The expected level of attainment for each of the program 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 (10)
(Articulate with rationale how the results of the evaluation of 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 (225)

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

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

Programme Outcomes (POs)

1) To obtain sound knowledge in the theory, principles and applications of computer systems.
2) Apply knowledge of mathematics, science, and engineering in the design and development of software systems.
3) Configure recent software tools, apply test conditions, and deploy and manage 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) Work cooperatively, responsibly, creatively, and respectfully in teams.
12) Understand professional and ethical responsibilities and analyze the impact of computing on individuals, organizations, and the society.

2.1.2. State how and where the POs are published and disseminated (3)
(Describe in which media (e.g. websites, curricula books) the POs are published and how these are disseminated among stakeholders)

The 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 of the POs (5)
(Describe the process that periodically documents and demonstrates that the POs are defined in alignment with the graduate attributes prescribed by the NBA.)

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 the Graduate Attributes prescribed by the NBA (10)

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

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 (10)

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 columns. A 'H', 'M', or 'L' mark on a cell indicates whether a PO in a columns has 'high', 'medium', or 'low' correlation with the corresponding PEO on the row. A blank cell indicates that there is no correlation between a particular PO and the PEO.

Program Educational	Program Outcomes (POs)

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Objectives (PEOs)												
	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

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

2.2. Attainment of Programme Outcomes (40)

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

(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.

Course Code and Title
CSL202 : Discrete Mathematics and Graph Theory

1. **Course Description**

   The study of discrete mathematical structures such as integers, graphs and logic. 3 lectures (3 hrs), 1 tutorial slot (1 hr), per week.
    Credit scheme - (L-T-P-C: 3-1-0-8)

2. **Required Background or Pre-requisite: NONE**

3. **Detailed Description of the Course**

   - Set theory, operations on sets – relation and functions, concept of infinity, permutations and combinations, Discrete probability theory   (2 Weeks)

   - Continuity, partial order, equivalence relations, Peano axioms and induction.
                                                                                (1 Week)

   - Mathematical logic, propositions, predicate logic, formal mathematical systems, PigeonHole principle   (2 Weeks)

   - Lattices, Boolean Algebra   (2 Weeks)

   - Semi groups, monodies, groups., Rings, fields, homomorphism, auto orphism
                                                                                (2 Weeks)

   - Combinatory, generating functions, Counting theorem   (1 Week)

   - Graphs, hypergraphs, transitive closure, trees,   (1 Week)

   - Eulerian tours, Hamiltonian cycles, Planar Graphs, Connectivity, Colourability, Line Graphs   (3 Weeks)

4. **Text books and/or other required material:**
   - Kolman,"Discrete Mathematical Structures for Computer Science",

   - Liu C.L" Combinatorial Mathematics", McGraw Hill Book Company

5. **Course Objectives**

   - This subject offers students an introduction to Discrete Mathematics oriented toward Computer Science and Engineering. It covers:

     Fundamental concepts of mathematics: definitions, proofs, sets, functions, relations, counting, Discrete probability theory
     Discrete structures: partial orders, lattices, groups, Boolean algebra
     Graph Theory and Introduction to Combinatory

- On completion, students will be able to explain and apply the basic methods of discrete mathematics.

- Students will be able to use the methods leant as part of this subject in subsequent courses in the design and analysis of algorithms, theory of computation, and compilers.

- Students would be able to reason mathematically about basic data types and structures (such as numbers, sets, graphs, and trees) used in computer algorithms and systems; distinguish rigorous definitions and conclusions; synthesize proofs,

- Students would be able to model and analyze computational processes using analytic and combinatorial methods.

6. Class/Tutorial Schedule

Lectures : 3 1-hr lectures per week
Tutorial: One 1 hr session per week (For a batch of 1/4th strength of the class)

7. Contribution of Course to Professional Component

Lecture: Students learn about Fundamental concepts of discrete mathematics, proof techniques and discrete structures.

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 "Discrete Mathematics and Graph Theory" 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 Discrete Mathematics and Graph Theory

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		L	L	H	L	M		H	L	M

Course Code and Title
CSL213 : Data Structures & Program Design – I   (DSPD-I)

1. **Course Description**

    The study of basic data structures, programming techniques, algorithms and structured programming. 3 lectures, 1 practical slot (2 hrs), per week.   Credit scheme - (L-T-P-C: 3-0-2-8)

2. **Required Background or Pre-requisite:** CSL101 : Computer Programming

3. **Detailed Description of the Course**

    *   Types and operations, Iterative constructs and loop invariants, Quantifiers and loops.
        (2 weeks)
    *   Structured programming and modular design, Illustrative examples, Scope rules, parameter passing mechanisms.   (1 week)
    *   Recursion, function invocations including recursion using program stack, examples.
        (1 week)
    *   Overview of arrays and array based algorithms - searching and sorting, Divide and Conquer – Mergesort, Quicksort, Binary search, Introduction to Program complexity (Big Oh notation), Recurrence relations. 2-D arrays and Sparse matrices.   (3 weeks)
    *   Structures (Records) and array of structures (records). Database implementation using array of records. Dynamic memory allocation and de-allocation. Dynamically allocated single and multi-dimensional arrays.

        (3 weeks)

    *   Concept of an Abstract Data Type (ADT), Lists as dynamic structures, operations on lists,   implementation of linked list using arrays and its operations. Introduction to linked list implementation using self-referential-structures/pointers. Files, operations on them, examples of using file.

        (2 weeks)

    *   Stack, Queues and its operations. Implementation of stacks and queues using both array-based and pointer-based structures. Uses of stacks in simulating recursive procedures/ functions. Applications of stacks and queues.   (2 weeks)

    Typical Laboratory Experiments : Based on recursion, arrays, sorting techniques. Course project to implement a database using array of structures/records and operations on this database.

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

    *   The C programming language: Brian Kerninghan and Dennis Ritchie, PHI-EEE (or Pearson)
    *   How to Solve it by Computer: R. G. Dromey, Pearson Education
    *   Data Structures & Program Design in C : Robert Kruse, G. L. Tondo and B. Leung PHI-EEE.

5. **Course Objectives**

- Appreciation and practice of structured programming
- Ability to formulate the problem, devise an algorithm and transform into code
- Ability to identify loop invariants and come up with pre/post conditions for a loop and default values. Ability to recognize the errors by analyzing loop invariants and pre/post conditions, without executing the program.
- Ability to analyze the complexity/efficiency of the algorithm and develop ability to improve the same
- Understanding different programming techniques and make an informed choice amongst them
- Understanding of the program/function implementation internally by the OS, concept of program stack etc.
- Understanding and analysis of different sorting algorithms, their advantages and disadvantages, selection of appropriate algorithm as per the properties of given data set
- Appreciation of concept of dynamic memory allocation and its utilization, dynamic data structures and implementation
- Understanding of concept of Abstract Data Type and implementations.
- Ability to communicate about program/algorithm efficiency and recognize a better solution

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 developing the algorithms/programs, analyze them and try to come up with efficient ways based on techniques learnt.

Lab: Students learn to implement programs using different programming techniques and data structures.

8. **Evaluation of Students**

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

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

The correlation of the COs of the course Data Structures and Program design – I (DSPD-I) 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 columns. A blank cell indicates that there is no correlation between the COs to a particular PO.

Correlation of COs of Data Structures and Program Design (DSPD) - I

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
H	H		H	H		M	H	M	L	M	

Course Code and Title

CSP201 : Software Lab 1

1. **Course Description**
   Students will learn UNIX like operating system and software tools like shell scripting, debuggers, AWK, SED, Emac etc used in the design of professional software.
   Two lab hours per week. Credit scheme - (L-T-P-C: 0-0-2-2)

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

3. **Detailed Description of the course**

   - Introduction to Linux OS and commands   (2 weeks)
   - Installing Linux   (1 week)
   - Gdb and DDD   (1 week)
   - Bash scripting   (2 weeks)
   - Unix tool – AWK, SED, Emacs   (2 weeks)
   - Parameter passing to C program from shell   (1 week)
   - HTML, XML, XSD and HTML / XML parsing   (2 weeks)
   - IDE like eclipse editing and debugging features   (1 week)

4. **Text books and/or other required material**
   - The UNIX Programming Environment – B. W. Kernighan
   - UNIX in a nutshell – O'Reilly
   - Classic Shell Scripting – O'Reilly

5. **Course Objectives**
   - Understand the installation of operating systems
   - Understand commands of UNIX and automate tasks using scripts.
   - Learn to use gdb and DDD
   - Learn to use AWK, SED and Emacs
   - Learn to use IDE like DevCpp, Visual Studio etc. to write large software and debug them.

6. **Class Schedule**
   Laboratory: One 2-hour slot per week

7. **Contribution of Course to Professional Component**
   Lecture: This is a course in software tools which makes students learn development environments, tools and also exposes them to build small professional software components.

8. Evaluation of students

The instructor uses the following methods: Assignments for each topic to be evaluated in the lab, and final evaluation at the end.

9. Relationship of Course Objectives to Program Outcomes

Correlation of COs of Software Lab 1

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
H	L	H	H	H	H	M	H		M	H	L

Course Code and Title
CSL302: Computer Organization

1. **Course Description**
    Students will learn the concepts of computer organization for several engineering computing systems. Students will develop the ability and confidence to use the fundamentals of computer organization as a tool in the engineering of digital systems.

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

2. **Required Background or Pre-requisite**
    ECL 209: Digital Circuits and Logic Design

3. **Detailed Description of the course**

    *   Basic Structure of Computer, Architecture Milestones, Performance Metrics
                                                                (1 week)
    *   ISA Level: Model, Data types, Instruction formats like expanding opcode, Addressing modes, instruction types, procedures, co routines, traps, interrupts etc.

                                                                (2 weeks)
    *   I/O organization: Program I/O, Interrupt I/O, DMA Hardware and software. Bus timing and design like synchronous/asynchronous etc. Standard I/O interfaces.
                                                                (2 weeks)
    *   Memory system: Addressability, Big and Little endian assignments. RAM organization and design. ROM and its variants. Cache design, mapping and performance of the memory hierarchy. Secondary storage architecture.
                                                                (2 weeks)
    *   Computer Arithmetic: Number Representation, Addition/Subtraction, Fast Adders, Multiplication and Fast Multiplication, Booths algorithm, FP operations, guard bits and truncation, IEEE 754 and implementing an FP unit
                                                                (2 weeks)
    *   Processing Unit: Instruction execution concepts, Single bus and multiple bus data paths, Hardwired control, Micro programmed control
                                                                (2 weeks)
    *   Assembly Language Concepts, Macros, Assembly process, linking and loading
                                                                (1 weeks)
    *   Advanced Concepts like pipelining, hazards, influence on instruction sets, superscalar operation, multi-core and multi-cpu architectures
                                                                (2 weeks)

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

    *   Hamacher, Carl V. et al , Computer Organization; 5th edition, McGraw Hill.
    *   Tanenbaum A.S., Structured Computer Organization; 4th edition, PHI.
    *   Patterson D. A., Hennessy J. L.; Computer Organization & Design: The Hardware/ Software Interface, 3rd edition, Elsevier

5. **Course Objectives**
   - Students will learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design.
   - Students will be able to identify where, when and how enhancements of computer performance can be accomplished.
   - Students will learn the sufficient background necessary to read more advance texts as well as journal articles on the field.
   - Student will see how to use concepts of computer organization in real-life settings using various PC performance improvements.
   - Students will also be introduced to more recent applications of computer organization in advanced digital systems.

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

7. **Contribution of Course to Professional Component**
   Lecture: This is an introductory course in Computer Organization designed for students to become familiar with the fundamentals of computer organization techniques and their application to computing systems. It provides essential tools that are needed from engineering professionals to measure a simple PC performance.

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

9. **Relationship of Course Objectives to Program Outcomes**
   Correlation of COs of Computer Organization

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
H	H	H		H	M	M	M			L	

Course Code and Title
CSL214 : Data Structures & Program Design – II   (DSPD-II)

1. **Course Description**

   The study of dynamically created data structures like linked lists, trees, and graphs. Study and examples of greedy and dynamic programming methods, for shortest path algorithm, all-pair-shortest-path, Huffman coding etc.
   3 lectures, 1 practical slot (2 hrs), per week.
   Credit scheme - (L-T-P-C: 3-0-2-8)

2. **Required Background or Pre-requisite:** CSL213 : Data Structures and Program Design - I

3. **Detailed Description of the Course**

   • Lists - Singly-linked lists, doubly linked lists and circular linked lists. List traversal, insertion, deletion at different positions in the linked lists, concatenation, list-reversal etc. Mergesort for linked lists.   (3 weeks)

   • Applications of lists in polynomial representation, multi-precision arithmetic, hash-tables etc. Multi linked structures and an example application like sparse matrices. Implementation of priority queues.   (2 weeks)

   • Trees , binary trees, binary trees- basic algorithms and various traversals.

                                                                            (2 weeks)
   • Binary Search Trees (BSTs) and insertion, deletion in BSTs. Height-balanced (AVL) trees, insertion/deletion and rotations. Heaps and heap sort.   (2 weeks)

   • Splay trees. Multi-way trees and external sorting, B-trees, Red-black trees. Introduction to B+ trees. Tries. Applications of these trees.   (2 weeks)

   • Generalisation of trees to graphs, representation & traversals. Dijkstra's shortest path algorithm, topological sort, all-pairs-shortest-paths, minimum spanning trees. Huffman coding. Introduction to network flow problem.   (2 weeks)

   • Introduction to Skip lists, data structures for disjoint set representation. (1 week)

   Typical Laboratory Experiments: Applications based on Linked Lists, Trees and Graphs.

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

   • Data Structures & Program Design in C : Robert Kruse, G. L. Tondo and B. Leung PHI-EEE.
   • Fundamentals of Data Structures in C : E. Horowitz, S. Sahni, and S. Anderson-Freed, University Press

- The C programming language: Brian Kerninghan and Dennis Ritchie, PHI-EEE (or Pearson)

5. Course Objectives

- Appreciation of dynamic data structures, advantages and disadvantages.
- Ability to formulate the problem, devise an algorithm and transform into code.
- Ability to identify problem requirements, constraints to be satisfied and ability to select the best possible data structures to satisfy the constraints.
- Ability to analyze the complexity/efficiency of the algorithm and develop ability to improve the same
- Ability to understand how a newer data structure gets designed as per the requirements and constraints.
- Understanding of advantages and disadvantages of different data structures which may be used to solve the same problem
- Introduction to different algorithmic programming techniques like greedy algorithms, dynamic programming etc. and ability to make an informed choice amongst them
- Ability to communicate about program/algorithm/data-structure efficiency (time and space) and recognize a better solution

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 different data structures, their advantages and disadvantages, ability to analyze them and their operations. They learn to appreciate different algorithmic techniques thus laying the foundation for Analysis of Algorithms course.

Lab: Students learn to implement programs/projects using different data structures and algorithmic techniques.

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

9. Relationship of Course Objectives to Program outcomes

The correlation of the COs of the course Data Structures and Program design – II (DSPD-II) 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 columns. A blank cell indicates that there is no correlation between the COs to a particular PO.

Correlation of COs of Data Structures and Program Design (DSPD) – II

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
H	H		M	H		M	H	M	L	M	

Course Code and Title
CSL204 : Concepts in Programming Languages

1. **Course Description**

   The course teaches the principles of procedural, imperative, and object oriented languages.
   3 lectures, 1 practical slot of two hours per week.
   Credit scheme - (L-T-P-C: 3-0-2-8)

2. **Required Background or Pre-requisite:** CSL 307 : Theory of Computation

3. **Detailed Description of the Course**

   - Definition of Programming language, Syntax, semantics. High - level languages. Implementation of high-level languages, Compilers and Software interpreters. Data elements, identifiers binding, binding time, binding identifiers to names, binding of attributes, importance of binding time. Concept of r-value and l-value. Effect of environment on a language. Language paradigms.   (1 Week)

   - Data type, elementary data type, structured data type, elements of specification and implementation of data type. Implementation of elementary data types: integer, real, character, Boolean and pointer. Implementation of structured data types. Vectors & arrays, records and files.

     (2 Weeks)

   - Type checking, type conversion and initialization.   (1 Week)

   - Evolution of data type concept. Abstract data type, encapsulation. Design and implementation of new data types through subprograms. Subprogram definition and activation, their implementation, parameter passing, generic subprograms.
     (2 Weeks)

   - Sequence control structures used in expressions and their implementation. Sequence control structures used between statements or group of statements and their implementation. Sequence control structures used between subprograms, recursive and non recursive subprogram calls. Data control, referring environment dynamic and static scope, static chain implementation and display implementation.   (2 Weeks)

   - Type definition as mechanism to create new abstract data types, type equivalence, type definitions with parameters. Defining new abstracts data types Storage management issues, like static and dynamic allocation, stack based allocation and management, Heap based allocation and management.

     (2 Weeks)

- Syntax specification of programming languages   (1 Week)

- Type systems for object oriented languages (polymorphism, inference, and abstract types), object oriented programming paradigm   (2 Weeks)

- Misc Issues: Multiprocessing and Multiprogramming, Scripting languages, Interpreted languages   (1 Week)

4. Text books and/or other required material:
- Pratt Terence, "Programming Languages, Design and Implementation", PHI

- Sethi Ravi, "Programming Languages", Addison Wesley

5. Course Objectives

- To provide an overview of different programming paradigms

- Improve the background for choosing appropriate programming languages for certain classes of programming problems

- Understand the implementation aspects behind different programming constructs

- Be able in principle to program in an imperative (or procedural), an object-oriented, a functional, and a logical programming language

- Understand the significance of an implementation of a programming language in a compiler or interpreter

- Increase the ability to learn new programming languages

- Increase the capacity to express programming concepts and choose among alternative ways to express things

- Simulate useful features in languages that lack them

- Be able in principle to design a new programming language

- Make good use of debuggers and related tools

6. Class Schedule

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

7. Contribution of Course to Professional Component

Lectures: Students learn about different programming languages, techniques to implement various programming constructs and different optimizations they can use.

Lab: Students learn the data structures and the algorithms required for implementation of programming languages. They also understand the different implementation strategies, with which they can write better and more efficient programs.

8. **Evaluation of Students**

   The instructor uses the following methods: 2 sessional exams, end-semester exam and one-on-one discussions during office hours.

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

   The correlation of the COs of the course Concepts in Programming Languages 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 Concepts in Programming Languages

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		L	H	L		L	L	M	L	

Course Code and Title

CSL 307: Theory of Computation

1. **Course Description**

   This course involves study of various models of computation such as finite automata, pushdown automata and Turing Machine. It also involves study of various grammars such regular grammar, context-free grammar and unrestricted grammar. Theory of undesirability is also studied in the course. 3 lectures per week.

   Credit scheme - (L-T-P-C: 3-0-0-6)

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

3. **Detailed Description of the Course**

   - Introduction, design of DFA, concept of NFA, NFA to DFA conversion, (5 weeks) concept of ε-NFA, ε-NFA to DFA conversion, regular expressions, regular expression to DFA   conversion,   DFA to regular expression conversion, minimization of DFA, pumping lemma, properties of regular sets, decision algorithms for regular languages
   - Design of context free grammar,   ambiguity, removal of useless symbols, (4 weeks) removal of ε productions, removal of unit productions, Chomsky normal form, Greibagh normal form, design of pushdown automata, deterministic and nondeterministic PDA, CFG to PDA and PDA to CFG conversion, properties of context free languages
   - Turing Machine model, TM variations, recursive and recursively   (3 weeks) enumerable sets, Chomsky hierarchy
   - Countable and uncountable sets   (1 week)
   - Concept of undesirability, reduction, showing undesirability of problems   (2 weeks) Post correspondence problem

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

   - John C. Martin, Introduction to Languages and The Theory of Computation, Tata McGraw-Hill Publishing Co. Ltd., Third Edition
   - J.E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages, and Computation Second Edition.
   - Michael Sipser, Theory of Computation, Cengage Learning

5. **Course Objectives**

   - Ability to model computation.
   - Understand the limitations of each model of computation.
   - To know the applicability of model of computation to different problems.
   - Develop analytical thinking and intuition for problem solving situations in related areas of theory of computation.
   - To know the limitations of computation, i.e. the insolvability of problems.

6. **Class Schedule**

   Lectures : 3 1-hr lectures per week

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

   Students learn various models of computation and their limitations. They know application of these models. They know limitation of computation.

8. **Evaluation of Students**

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

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

   The coorelation 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 indicates 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				M	H	L				

Course Code and Title
CSL312: Operating Systems

1. **Course Description**

   The study of basic techniques in the design and development of Operating Systems and understanding solutions of the fundamental problems in operating systems like process synchronization, memory management, deadlock detection, input-output management, etc.

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

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

   CSL 302: Computer Organization

3. **Detailed Description of the course**

   - Introduction to OS concepts, evolution, OS structures and system calls
     (1 week)
   - File System: FS concepts, FS implementation, Links, free space management, LFS, JFS, VFS, Backups, FS consistency and performance   (2 weeks)
   - I/O: Hardware and software for I/O, methods, storage structures, stable storage etc.
     (1 week)
   - Memory management: Introduction, Paging, segmentation, combined schemes
     (1 week)
   - Virtual memory, page replacement, thrashing, stack based algorithms, allocating kernel memory   (2 weeks)
   - Process introduction, CPU scheduling, Threads   (1 week)
   - Process synchronization concepts, Bernstein's conditions, algorithmic solutions: Peterson etc, hardware solutions   (1 week)
   - Bakery algorithm, Burn's algorithm, semaphores   (1 week)
   - Classical problems: PC problem, Readers-Writers problem, Dining Philosophers problem, Sleepy barber   (1 week)
   - Monitors and solutions to classical problems   (1 week)
   - Deadlock Characterization, detection, avoidance, recovery etc.   (1 week)
   - System Protection and security   (1 week)

4. **Text books and/or other required material**
   - Silberchatz & Galvin, "Operating Systems Concepts", Wiley
   - Tanenbaum, "Modern Operating Systems", PHI

5. **Course Objectives**
   - Understand the structure and design issues of operating systems.
   - Learn about and understand theoretical concepts and programming constructs used for the operation of modern operating systems.
   - Understand concepts of OS management domains like process, memory, file systems, storage etc.
   - Familiarity with operating systems like Unix.
   - Gain practical experience with software tools available in modern operating systems such as semaphores, system calls, sockets and threads.

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

7. **Contribution of Course to Professional Component**
   Lecture: Students learn about the design and development of operating systems. They will be able to understand the various algorithms used in implementing operating systems and can analyze different algorithms for their implementation.

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

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

Correlation of COs of Operating 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	M			L	

Course Code and Title

CSL 313:Analysis of Algorithms

1. **Course Description**

   Study of the techniques for analysis of algorithms, Study of the design technique for algorithms such as divide-and-conquer, greedy method, dynamic programming, backtracking and branch-and-bound, randomized algorithms, Study of the theory of NP-completeness. (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, Probability theory, Mathematics.

3. **Detailed Description of the Course**

   - Asymptotic Notations-Big-Oh, Big-omega and Big-theta notations   (1week)
   - Recurrence relations –Substitution method   (2 weeks)
     Recursion tree methodMaster Method
   - Analysis of Algorithms-Best case, Worst case and Average case   (1 week)
   - Sorting algorithms-selection sort, bubble sort, insertion sort,   (2 weeks)
     andHeap sort, Lower bound on sorting algorithms
   - Divide-and-conquer-skeleton of the technique, binary search, quick sort,
     merge sort   (1 week)
   - Greedy method-basic technique, minimum spanning trees, all point shortest paths
            (1 week)
   - Counting sort, problems and applications of the same, radix sort   (1 week)
   - Dynamic Programming-basic fundamentals of the technique, application to string edit distance problem, longest common subsequence problem, travelling salesman problem   (2 weeks)
   - Backtracking-basic fundamentals of the technique, application to n-queens problem, graph coloring problem   (1 week)

   - Branch-and-bound-description of the technique, illustration through suitable Examples like travelling salesman problem, job assignment problem
            (1 week)
   - Randomized algorithms and their analysis randomized quick sort, analysis of bucket sort.   (1 week)
   - Theory of NP-completeness- Definition of the terms NP, NP-hard and NP-complete, showing NP-completeness of a problem   (2 weeks)

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

   - Thomas H. Cormen et al., *Introduction to Algorithms*, PHI, Second Edition.

   - E. Horowitz, S. Sahni, S. Rajasekaran, *Fundamentals of Computer Algorithms*, University Press, Second Edition.

   - Gilles Brassard and Paul Bratley, *Fundamentals of Algorithmics,* PHI, Original Edition.

5. Course Objectives

- Appreciate the need for analysis of algorithms.
- How to analyze the best-case, average-case and the 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 NPComplete problems.

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 analyze the algorithms.

8. Evaluation of Students

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

9. Relationship of Course Objectives to Program outcomes

The co-relation 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 indicates that there is no correlation between the CO 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				

Course Code and Title
CSL303 : Introduction to Object Oriented Methodology   (IOOM)

1. **Course Description**

    The study of object oriented paradigms and applications, different design methodologies and tools.

    3 lectures, 1 practical slot (2 hrs), per week.
    Credit scheme - (L-T-P-C: 3-0-2-8)

2. **Required Background or Pre-requisite:** CSL214: Data Structures and Program Design - II

3. **Detailed Description of the Course**

    *   Object Oriented Programming, Features of object oriented programming languages like data encapsulation, inheritance, polymorphism and late binding.
        (3 weeks)

    *   Concept of a class, Access control of members of a class, instantiating a class, static and non-static members, overloading a method.   (2 weeks)

    *   Deriving a class from another class, access control of members under derivation, different ways of class derivation, overriding of a method, run time polymorphism.   (2 weeks)

    *   Concept of an abstract class. Concept of an interface. Implementation of an interface.
        (1 week)

    *   Exception and exception handling mechanisms. Study of exception handling mechanisms in object-oriented languages   (1 week)

    *   Introduction to streams, use of stream classes. Serialization and de-serialization of objects.   (1 week)

    *   Templates, Implementation of data structures like linked lists, stacks, queues, trees, graphs, hash table etc. using object oriented programming languages.
        (2 weeks)

    *   Introduction to concept of refactoring, modeling techniques like UML, Design patterns.
        (2 weeks)

    Typical Laboratory Experiments : Applications using on different object oriented concepts.

4. **Text books and/or other required material**
    *   Bjane Strostrup, "The C++ programming language", Addison-Wesley
    *   Herbert Shildt, "C++: The Complete Reference", 4th Edition
    *   Arnold Ken, Gosling J, "The Java Programming Language", Addison Wesley
    *   Matt Weisfeld, "The Object-Oriented Thought Process", Pearson

- Cox Brad, "Object –Oriented Programming: An Evolutionary Approach", Addison – Wesley

5. **Course Objectives**

- Appreciation and understanding of object oriented concepts and their utility.
- Ability to formulate the problem, come up with object oriented design
- Practicing use of different features of Object Oriented Methodology like templates, exception handling, reflection etc.
- Study and use of design tools like UML, design patterns etc.
- Study different systems and apply different design methodologies based on the problem specification and objectives

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 different aspects of object-oriented design. They learn different mechanisms to achieve the design catering to the specification and requirements. Students develop the ability to analyze different designs for their utility.

Lab: Students learn to implement programs/projects using different object oriented methodologies.

8. **Evaluation of Students**
The instructor uses the following methods: home-work assignments, 2 sessional exams, end-semester exam and course projects, 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 Introduction to Object Oriented Methodology (IOOM) 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 Introduction to Object Oriented Methodology (IOOM)

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	H	M	M	H	M	M	M	L

Course Code and Title
CSP314: Software Lab 2

1. Course Description

Students will learn advanced software tools like shell scripting, profilers, debuggers etc used in the design of professional software.

Two lab hours per week. Credit scheme - (L-T-P-C: 0-0-2-2)

2. Required Background or Pre-requisite

CSP 310: Software Lab 1

3. Detailed Description of the course

• Advanced UNIX commands, Makefiles	(1 week)
• Bash scripting	(1 week)
• Versioning systems CVS/SVN	(1 week)
• Profilers	(1 week)
• Perl/Ruby	(2 weeks)
• Installing Linux, Apache, Mysql	(1 week)
• IDE like eclipse editing and debugging features	(1 week)
• OS related exercises like fork, synchronization, multithreading etc.	(2 weeks)
• Mini project like garbage collector, interrupt handler	(1 week)

4. Text books and/or other required material
- UNIX in a nutshell – O'Reilly
- Classic Shell Scripting – O'Reilly
- Introducing Perl – O'Reilly
- The Ruby Programming Language – O'Reilly

5. Course Objectives
- Understand the installation of operating systems, web server and databases and their configuration.
- Understand advanced commands of UNIX and automate tasks using scripts.
- Understand software versioning and maintenance.
- Understand programming languages like Perl and Ruby.
- Learn to use IDE like Visual Studio, Eclipse etc. to write large software and debug them.
- Learn to implement and use OS features like fork, threads, mutex etc.
- Build a mini project using the overall concepts learned in the lab.

6. Class Schedule

Laboratory: One 2-hour slot per week

7. **Contribution of Course to Professional Component**
    Lecture: This is an advanced course in software tools which makes students learn development environments, tools and also exposes them to build small professional software components.

8. **Evaluation of students**
    The instructor uses the following methods: Assignments for each topic to be evaluated in the lab, and one mini project at the end.

9. **Relationship of Course Objectives to Program Outcomes**
    Correlation of COs of Software Lab 2

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	H	H	H	M	H		M	H	L

Course Code and Title
CSL306 : System Programming (SP)

1. **Course Description**

   The basic objective is to know the machine/system at hardware or at system programmer level. It covers design issues of all major system software. Students must be able to write small goal oriented system programs at the end of the course.
   3 lectures per week and 2 hour laboratory work per week
   Credit scheme - (L-T-P-C: 3-0-2-8)

2. **Required Background or Pre-requisite:** CSL301 : Microprocessor Based System

3. **Detailed Description of the Course**

   - Introduction of Pentium Machine Architecture, Addressing modes, Instruction coding, various instruction.   (04 weeks)

   - Assembler- Concept of assembler, design of single pass and two pass assembler, forward reference, design of output file of assembler.   (01 week)

   - MacroProcessor- concept of macro, macro call within macro, macro definition within macro, recursive macro calls, design of macro processor.   (01 week)

   - Linker and Loader - Concept of static and dynamic relocation, external symbols, design of linker, design of object file for different loading schemes.   (02 week)

   - Common Object file format - Structure of object file and executable file, section or segment headers, symbol table, concept of storage class, string various, data types line insert, character, arrays structures.   (01 week)

   - System utilities - Source code control system, make, link editor, symbolic debugger, pattern matching language like awk.   (02 week)

   - Device Drivers **-** Device programming, system drivers, non system drivers, virtual drivers, Incorporation of driver routines, Basic device driver operation, character and block drivers.   (03 week)

   - Lexical Analysis **-** Role of lexical analyzer, recognition of tokens, tool for study of lex.
                                                                         (01 week)

4. **Text books and/or other required material**
   - The Intel Microprocessors- Barry Bray: Eight Edition, Pearson Publication
   - Assembly and Assemblers - Gorsline , G.W, Pearson Publication
   - Unix programming Environment- Kerningham and Pike, , Pearson Publication
   - Writing Unix device devices- Easan I., Janet, Thomas J.Teixeria, Wiley publication
   - Unix Device Drivers – . Pajari George: , Pearson Publication

5. **Course Objectives**

- To understand the basic machine structure.

- Able to understand any microprocessors working, programming, addressing modes, machine conversions etc.

- To know the importance of system programming.

- To study the working of different system programs

- Able to design the procedures for different system programs.

- Able to design own system programs in future.

6. **Class Schedule**

   Lectures : 3 1-hr lectures per week

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

   Lecture: Students learn about working of processors, design and procedures for different system programs, use of some of the important system utility for code development.
   Practical : They experience the actual designing steps of different system programs.

8. **Evaluation of Students**
   The instructor uses the following methods: 2 sessional exams, end-semester exam, class test to evaluate theory part while in laboratory, programming assignments are given and continuous evaluation is performed.

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

   The correlation of the COs of the course Artificial Intelligence 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 columns. A blank cell indicates that there is no correlation between the COs to a particular PO.

<p align="center">Correlation of COs of System Programming</p>

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		H	H	M	L	M

Course Code and Title
CSL305: Computer Graphics

1. **Course Description**

Study of display devices, various graphics packages, vector and raster graphics, graphics hardware, user interface issues – 2D desktop metaphors and for 3D interaction devices, coverage of modelling including NURB curves and surfaces, solid modelling, human colour-vision system and various colour description system, etc.

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

2. **Required Background or Pre-requisite:** No pre-requisite

3. **Detailed Description of the Course**

- Introduction – Image processing as picture analysis, Advantages of interactive graphics, uses of computer graphics and classification of application, conceptual framework for interactive graphics. Display devices (color monitors), Input devices (mouse, keyboard, joystick, touch screen, trackball), Output devices (LCD panels, laser printers, color printers. Plotters etc.), Interfacing devices such as, video I/O, TV interface etc.   (1 weeks)

- Graphics hardware – Display technology such as – CRT display devices, Types of CRT devices like DVST (Direct View Storage Tube), Calligraphic or Random Scan display system, Refresh and raster scan display system and their architecture. Understand various frame buffers, Study LCD and flat panel display devices.

                                                (2 weeks)

- Some 2D concepts - 2D transformation and Matrices for scaling, rotation, transformation, reflection and shearing. Homogeneous coordinate system, composite transformation, Co-ordinate system, window and viewport. Transformation of parallel and intersecting lines.
                                                (2 weeks)

Sessional – I

- 3 Dimention Matrix representation, 3D viewing – Projections – parallel and perspective, The mathematics of Planer Geometric Projections, Implementing Planer Geometric Projections, Coordinate Systems, Normalizing transformation matrix.   (2 week)

- Drawing 2 D primitives – Scan converting lines, Circles, Ellipse, polygon filling, clipping lines and polygon.   (2 week)

- Curve representation – Parametric Cubic Curves, Parametric Bicubic Surface, mathematical representation of B-splines curves and Beziers Curves.   (1 week)

- Visible surface Detection – Techniques for efficient visible surface algorithms, Algorithms for visible-line determination, the z-buffer algorithm, List-priority algorithm, Scan-line algorithm, area sub-division algorithm.   (3 weeks) (2 weeks)
- Achromatic and colored light – Chromatic colour, Colour models for raster graphics, reproducing colors, using colours in Computer Graphics.   (1 week)
- Solid Modeling – Representing solids, Regularized Boolean set operations, Sweep representation, Boundary representations, Constructive solid geometry.   (1 week)

End Sem Exam

Text books and/or other required material

- Computer Graphics; Principles and practice; 2nd edn. in C; J. Foley, A. Van Dam, Feiner and Hughes; Addison Wesley, 1997.
- Mathematical elements for Computer Graphics; 2nd edn.; D. F. Rogers and J. A. Adams; McGraw-Hill International. Edn., 1990.
- Computer Graphics - C version; D. Hearn and M. P. Baker; Pearson Education, 2004.
- Computer Graphics using OpenGL; 2nd edn.; F. S. Hill Jr.; Pearson Education, 2003.
- Procedural Elements for Computer Graphics; 2nd Edn., D. F. Rogers, Tata McGraw-Hill, 2002

4. **Course Objectives**

- Ability to understand various graphics packages. Understand display, manipulation and storage of pictures and experimental data for proper visualization using a computer.
- Understand internal design of display devices like CRT EGA/CGA/VGA/SVGA monitors, flat panal and plasma displays. Study of frame buffers
- Understand what are 2D transformation and matrices, 3D graphics and viewing w.r.t. 2D screen co-ordinate systems.
    - Study of scan converting line, circle, ellipse, polygon filling and clipping.
    - Understand RGB, HSV and CMY colour space
    - Understand curve and surface representation, hidden surface detection model.

5. **Class Schedule**

    Lectures : 3 1-hr lectures per week

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

    Students learn about raster graphics packages, raster graphic features, basic raster graphics algorithms for drawing 2D primitives. They get clear vision about Geometrical transformation, viewing in 3D including various projections. Students learn very well about representing curves and surfaces, Solid modelling and Achromatic and colored light. Also visible surface determination. Some introductory part of Image manipulation and storage.

7. Evaluation of Students

The instructor uses the following methods: 2 sessional exams, end-semester exam, assignments on some numerical problems.

8. Relationship of Course Objectives to Program outcomes

Correlation of COs of Topics in Embedded 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	H	M		M	L	L	

Course Code & Title
CSL403 : Database Management System

1. Course Description:

The course is introduced to teach concepts of DBMS which is regarded as backbone in application software. The basic concepts like database design, performing basic operations, performance and tuning, implementation of ACID properties are important from industry perspective.

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

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

3. Expanded course description :

- Introduction:DBMS, Challenges, Progress and New advances   (week 1)
- SQL: Basic operations, : Set operations, IN ,EXISTS, Cartesian Product,joins (week 1)
- SQL: Aggregate, With clause,inlineviews, Analytical queries, Rollup, CUBE,scaler subqueries   (week 1)
- SQL:DML statements,Multitable DML, Integrity Constraints, Views   (week 1)
- Relational Database Design: ER diagram   (week 1)
- Relational Database Design: Functional Dependancy   (week 1)
- Relational Database Design: Normal forms   (week 1)
- Relational Database Design: Multivalued Dependancy, Concept of Database triggers and Assertions   (week 1)
- Anatomy of DBMS,process,memory and disk structure   (week 1)
- ACID properties   (week 1)
- Concurrency control and Isolation level   (week 1)
- Logical and Physical storage   (week 1)
- Query optimization   (week 1)
- Security and auditing   (week 1)

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
- Oracle 11g Concepts guide
- Oracle 11g Administration Guide
- Oracle 11g Performance and Tuning

Lab Experiments:

- Basic SQL queries
- Advanced SQL queries
- Implementation of stored procedures and database triggers
- ER diagram and translation of ER diagram into DDL statements
- Implementation of index structure like B or B+ tree.
- Query optimization.

5. Course Objective:

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

- Understand how to perform basic operations with DBMS.
- Understand advance concepts like analytical functions, ROLLUP and CUBES, multitable DML operations.
- Understand database design process using ER diagram and Normalization.
- Understand validation framework like integrity constraints, triggers and assertions.
- Understand ACID properties and their implementation.
- Understand concurrency control mechanism using lock based protocols and timestamp based protocols.
- Understand various storage structures and query optimization.

6. Class and Lab Schedule

Lecture : Three per week(60min each)
Lab: One per week(120min)

7. Contribution of Course to Professional Component

Lecture: Student learn about SQL, database design concepts, performance and tuning, backup and recovery, concurrency control

Lab: Student learn about writing basic queries, advance queries, constructing ER diagram, translation of ER diagram and query optimization using ORACLE RDBMS and various tools.

8. 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

9. 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 indicates that there is no correlation between the COs to a particular PO.

Correlation of COs of Database Management 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	H	M	L	L	

Course Code and Title
CSL404 : Language Processor

1. **Course Description**

   The study of basics of compiler construction, parsing, intermediate code generation and code optimization.
   3 lectures, 1 practical slot (2 hrs), per week.
   Credit scheme - (L-T-P-C: 3-0-2-8)

2. **Required Background or Pre-requisite:** CSL 307 : Theory of Computation

3. **Detailed Description of the Course**

   - Introduction to compilers, compilers and translators, phases and passes of a typical compiler   , Dealing with ambiguity of the grammar.   (1 Week)

   - Syntax specification of programming languages, Design of top-down parser, Recursive Decent and Predictive parsing, LL(1) parsing   (2 Weeks)

   - Bottom up parsing technique, Operator Precedence Parsing, LR parsing algorithm, Design of SLR, LALR, CLR parsers.   (2 Weeks)

   - Study of syntax directed definitions and syntax directed translation schemes. Using syntax directed translation schemes for translation of expressions, controls structures, declarations, procedure calls.   (3 Weeks)

   - Storage allocation and run time storage administration, symbol table management, Error detection and recovery, error recovery in LR parsing, error recovery in LL parsing, Automatic error recovery in YACC   (1 Week)

   - Introduction to Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, setting up data flow equations to compute reaching definitions, available expressions, Live variables for doing constant folding, code hoisting   (3Weeks)

   - Problems in code generation, simple code generator code generation from DAG, Peephole optimization   (2 Weeks)

   Typical Laboratory Experiments: Based on usage of Lex and Yacc. Recognizing a language, translating a language, generating intermediate code.

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

   - Principles and practice of compiler writing : Aho, Sethi, Ullman, Addison Wesley
   - Crafting a compiler : Fischer and LeBlanc, Addison Wesley
   - Principles of Compiler Design : Aho A. V., Ullman J.D, Narosa Publishing House.

5. Course Objectives

- To inform students about different parsing techniques, techniques to generate intermediate code and different optimization techniques.
- The student should be able to analyze issues associated with the implementation of higher-level programming languages.
- This course introduces students how a compiler translates the higher level language into machine language.
- Students should know in detail algorithms used in creating a correct and optimized translation.
- Students should be able to build a working compiler of their own.
- The students will also appreciate the need of understandable error reports, accurate and reliable object code, and strict adherence to industry standards.
- Understanding of compiler optimization techniques would enable students to write reasonably efficient programs.

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 different parsing techniques, techniques to generate intermediate code and different optimization techniques.

Lab: Students learn to implement techniques used in working compilers.

8. Evaluation of Students
The instructor uses the following methods: 2 sessional exams, end-semester exam and several lab projects, one-on-one discussions during office hours.

9. Relationship of Course Objectives to Program outcomes

The correlation of the COs of the course Language Processors 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 Language Processors

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		L		H	L	M		

CSL313: Computer Network

1. **Course Description**

Study of TCP/IP and ISO OSI network layers in detail. Study of LAN, WAN, MAN and VLAN configuration. Types of cables with their specifications, MAC layer protocols, multiplexing concepts in networking, packet switched network, routing algorithms, ATM network, satellite communication, IPv4, IP address, study of IP, TCP, UDP, DHCP, DNS, SNMP, SMTP, FTP, protocols. Multicasting, Broadcasting, Subnet, Superrnet. Introduction to network security issue.

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

2. **Required Background or Pre-requisite:** Signals and Systems

3. **Detailed Description of the Course**

- Fundamentals of computer networking - classification as LAN, WAN etc - topologies and their characteristics - packet switching - virtual circuits and datagram's - unicast, multicast and broadcast - layered architecture, protocols and services - types of services - OSI model, principles, layers and functions - TCP/IP model and comparison.

- Review of signal and system analysis - relation between rise time and bandwidth, analog and digital transmission - transmission line concept, impedance and reflections - optical fibers, sources and detectors - multimode and single mode - point-to-point links - digital radio at VHF/UHF -modulation methods: PCM, DM, ADM etc - leased lines, E1 lines - RZ and NRZ versions of various types of formats - ASK, PSK, FSK, QPSK etc - phone line modems and speeds - introduction to spread spectrum techniques.

Sessional – I

- Multiple access protocols – Pure and slotted aloha, 1-persistance, p-persistence and non-persistence protocol, CSMA, CSMA/CD, CSMA/CA protocols, FDM, TDM, ATDM and CDMA (Code division multiple access).

- Data link layer design issues - framing, services, error control and flow control - CRC and FEC codes - protocols: stop and wait, go-back, selective repeat - simple analysis of protocols - PPP and HDLC case studies

- Medium access protocols - ALOHA, slotted ALOHA, carrier sense protocols - CSMA-CD - token passing - IEEE 802 standards: Ethernet 802.2, 802.3 frame formats, protocols, and performance and hardware details - introduction to 802.4, 802.5 and 802.11 - FDDI - introductions to network management and SNMP.

- Network layer – virtual circuit and datagram, IP protocol, routing algorithms, routing in the internet, congestion control and internetworking, IP address classes, IPv4 and Ipv6 as case studies.

- Transport layer - design issues, connection establishment and release, timer management, multiplexing, flow control, TCP and UDP as case studies, network performance measurement and optimization.

- Application layer – Study of FTP, Telnet, SMTP, SNMP,

- Security – Principles of Cryptography, Authentication, Integrity, keys – public & private.

End Sem Exam

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

- Jim Kurose, Keith Ross "Computer Networking : A Top - Down approach Featuring the Internet", 2nd edition. Addision-Wesley, July 2002
- William Stalling "Data and Computer Communication" 6th edition, Prentice Hall
- Behrouz A Forouzan "Data Communications and Networking" The McGraw-Hill Companies.
- Larry L. Peterson and Bruce S Davie "Computer Networks a system approach" 5th edition Elsevier.
- Andrew Tanenbaum " Computer networks" 4th edition PHI

5. **Course Objectives**

- Understand TCP/IP and ISO OSI network layer.
- Study of various layers functions. Understand LAN, WAN, MAN and VLAN.
- Understand practically working of L2 switch, L3 switch and Routers and their functionality.
- Practically understand the working of hubs/switches/routers and security.
- Can evaluate performance of various MAC layer protocol.
- Ability to write program using socket programming.
- Ability to implement protocol for two systems and for a group of systems.
- Performance evaluation of protocols for AdHoc networks.
- Performance evaluation of EPABX, ISDN system and VOIP.
- Evaluation of protocol on QualNet software.

6. **Class Schedule**

Lectures : 3 1-hr lectures per week
           1 2-hr practical per week

7.   Contribution of Course to Professional Component

Students learn about various protocols functioning at various layers – theory as well as practical. IP addressing at network layers, Routing in LAN and internet. Data link layer protocols. Medium access control protocols with performance evaluation. TCP and UDP study. Introduction to Security issues. Physical layer devices, their specification and performance evaluation. Ad-hoc network protocol performance evaluation in practical. Practically study working of Hubs, Switches- L2, L3 and routers. Practical study of tunnelling in IP network. Experimental study of EPABX and IPPBX working. Experiments on wireless LANs.

8.   Evaluation of Students

The instructor uses the following methods: 2 sessional exams, end-semester exam, assignments and practical evaluation –I and II .

9.   Relationship of Course Objectives to Program outcomes

Correlation of COs of Topics in Embedded 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	H	M		M	L	L	

Course Code and Title
CSL408 : Topics in Embedded Systems

1. **Course Description**

   The design of Embedded Hardware like Microcontrollers - AD and DA converter, timers, interrupts and DMA controllers, FPGA etc. The study of fundamental issues in real time operating systems like timing constraints, real time task scheduling, handling resource sharing, critical section, deadlocks, real time communication over packet switched network, etc.

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

2. **Required Background or Pre-requisite:** CSL312 : Operating Systems, Computer Architecture Organization, Computer Netwoks.

3. **Detailed Description of the Course**

   - Embedded System Overview – Design challenges – Optimizing design metrics, Processor technology, IC Technology, Design Technology, Single purpose, general purpose, and application specific processors, Interfacing ICs, Timer ICs, Interrupt controllers, etc.

     (3 weeks)
   - Introduction – Real Time Systems, applications of real-time systems, a basic model of real time systems, Characteristics of real time systems, Safety-reliability issues, types of real time tasks, timing constraints, modeling timing constraints.   (2 weeks)

     Sessional - I
   - Real-Time Task Scheduling – Types of real-time tasks and their characteristics, task scheduling, clock-driven scheduling, hybrid schedulers, event driven schedulers, EDF and RMA algorithms and various examples. Issues related with those algorithms. (3 weeks)

   - Handling resource sharing and dependencies among real-time tasks - Resource sharing among real time task, priority inversion (PI), types of priority inversion, priority inheritance protocol (PIP), Highest locker protocol (HLP), priority ceiling protocol (PCP), handling task dependencies   (2 weeks)

     Sessional -II
   - Scheduling real-time tasks in multiprocessor and distributed systems – Multiprocessor task allocation, dynamic allocation of task, fault-tolerant scheduling of tasks, clocks in distributed real-time systems, centralized and distributed clock synchronization.

     (3 weeks)
   - Commercial real time operating systems – Time services, Features of a real-time operating system, Unix as a RTOS, Windows as a RTOS   (2 weeks)

   - Real-time communication – Applications requiring Real-Time Communication, Basic networking concepts, Real-time communications in LAN, Soft and Hard real time communication in LAN, Bounded access protocols real-time communication over packet switched network, Routing, resource reservation protocol.   (3 weeks)

     End Sem Exam

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

- Rajib Mall, "Real-Time Systems" Theory and Practice
- Alan C. Shaw, Real-Time Systems and Software, Wiley, 2001.
- Philip Laplante, Real-Time Systems Design and Analysis, 2nd Edition, Prentice Hall of India.

5. **Course Objectives**

- Ability to understand and design embedded hardware, challenges in designing and implementing real rime systems.
- Understand real time task scheduling, resource sharing and dependencies among real-time tasks
- Ability to make choices from among available embedded hardware and OS for any specific real time systems.
- Ability to present different design decisions made for real time system implementations, and their experimental evaluation.

6. **Class Schedule**

   Lectures : 3 1-hr lectures per week

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

   Students learn about the design and development of real time systems. They are able to understand the various primitives used in implementing real time systems related to hardware and software and can analyze different algorithms for their implementation.

8. **Evaluation of Students**

   The instructor uses the following methods: 2 sessional exams, end-semester exam, assignments on some interesting problems.

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

   Correlation of COs of Topics in Embedded 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	H	M		M	L	L	

Course Code and Title
CSL412 : Artificial Intelligence (AI)

1. **Course Description**

   The study of basic techniques in AI like search, constraint satisfaction, game playing, logic – propositional and first order, planning, and uncertainty.
   3 lectures per week.   Credit scheme - (L-T-P-C: 3-0-0-6)

2. **Required Background or Pre-requisite:** CSL313 : Analysis of Algorithms

3. **Detailed Description of the Course**

   - Introduction to AI, Agents and Environment Types.   (1 week)
   - Uninformed Search strategies – BFS, DFS, Uniform Cost search, Iterative Deepening Search, Bidirectional Search.
        (1 week)
   - Informed/Heuristic Search strategies – A*, Properties of A*, RBFS, Memory Bounded A*, Heuristic Functions, Local Search, Online Search   (2 weeks)
   - Constraint Satisfaction Problems – MRV and LCV heuristics, forward checking, constraint propagation, intelligent backtracking, problem decomposition, local search for solving CSPs   (1 week)
   - Game Playing – Minimax search, alpha-beta pruning, evaluation functions, games with chance, expectiminax.   (1 week)

   - Logical Agents - Introduction to Propositional Logic, Entailment, Inference using truth table enumeration, Theorem Proving and proofs, Validity, Satisfiability, Resolution, Conversion to CNF, Example of Resolution, Horn Clauses, Forward and Backward chaining, DPLL algorithm, Local Search for Satisfiability.

                                                                              (3 weeks)

   - First Order Logic, Querying in FOL, Inference in FOL, Semi-decidability, Generalized Modus Ponens, Unification, Indexing for efficient unification, Forward Chaining, Backward Chaining, Introduction to Prolog, Resolution in FOL, Conversion to CNF, Resolution for non-definite and definite clauses, theorem provers   (2 weeks)

   - Planning, STRIPS, ADL, Forward and Backward search for planning, Partial Ordered Planning, Planning graphs and using them for heuristics, Graph Plan, SAT Plan.   (2 weeks)

   - Uncertainty – Utility Maximization, Probability basics, conditional probability, joint distribution table, reasoning using full joint distribution table, Independence, Baye's rule, Conditional independence, Bayesian Networks, Construction of Bayesian Networks, Exact Inference, Approximate Inference – Rejection Sampling, likelihood weighting, MCMC   (2   weeks)

4. **Text books and/or other required material**
   - Artificial Intelligence a Modern Approach : Russel and Norvig , Pearson Education
   - Artificial Intelligence – A Practical Approach : Patterson , Tata McGraw Hill

5. **Course Objectives**
   - Appreciation of fundamental problems in artificial intelligence (AI).
   - Ability to generate precise formulation(s) of AI problems in terms of knowledge representation and search from imprecise English description(s).
   - Ability to design intelligent agents for problem solving, reasoning, planning, and decision making.
   - Ability to make intelligent choices from among available algorithms and knowledge representation schemes subject to specific design and performance constraints.
   - Ability to implement and evaluate intelligent agents for representative AI problems – e.g., constraint satisfaction, automated theorem proving, etc.
   - Familiarity with some current applications of AI.
   - Ability to communicate effectively about AI problems, algorithms, implementations, and their experimental evaluation.

6. **Class Schedule**

   Lectures: 3 1-hr lectures per week

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

   Lecture: Students learn about developing the algorithms/techniques for solving artificial intelligence problems. They are able to analyze the different solution techniques and try to implement efficient methods.

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**

   The coorelation of the COs of the course Artificial Intelligence 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 indicates that there is no correlation between the COs to a particular PO.

   Correlation of COs of Artificial Intelligence

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	L	L	

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 inter procedural optimization, instruction scheduling.
                                                                                 (3 weeks)

   - Compiling for High performance architectures, Compiling for scalar pipeline, compiling for vector pipeline, superscalar 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 modelling

- 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	

Course Code and Title
CSL436 :Information Retrieval

1. **Course Description**

   The study of basic Information Retrieval techniques, data structures and algorithms in Information retrieval
   3 lectures (1 hour each) per week
   Credit scheme - (L-T-P-C: 3-0-0-6)

2. **Required Background or Pre-requisite: CSL 213:** Data Structures and Program Design I and Data Structures and Program Design II

3. **Detailed Description of the Course**

   - Boolean retrieval   (1 week)
   - the term vocabulary and postings lists,   (1 week)
   - Dictionaries and tolerant retrieval,   (1 week)
   - Introduction to index-construction and index-compression   (1 week)
   - Scoring, term weighting and the vector space model   (2 weeks)
   - Computing scores in a complete search system, Evaluation in information retrieval, Introduction to Relevance feedback and query expansion.   (2 weeks)
   - Probabilistic information retrieval, review of basic probability theory, the probability ranking principle, the binary independence model   (2 weeks)
   - Language models for information retrieval, Language modelling versus other approaches to IR, Text classification and Naive Bayes, Bayesian Network approaches to IR.
   (2 weeks)
   - Vector space classification, Support vector machines and machine learning on documents, Fl at clustering, Hierarchical clustering, Matrix decomposition and latent semantic indexing.   (2 weeks)
   - Introduction to Web search basics, Web crawling and indexes, Link analysis   (1 weeks)

   Typical Assignments : Based on techniques studied, implementation of those techniques, study of research papers.

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

   - An Introduction to Information Retrieval: Christopher D. Manning, PrabhakarRaghavan, HinrichSchütze, Cambridge University Press, Cambridge, England, 2009
   - Information Retrieval: Implementing and evaluating search engines: Stefan Büttcher, Charles L. A. Clarke, Gordon V. Cormack, MIT Press, 2010

Reference Books

- Information Retrieval: Algorithms and Heuristics : David A. Grossman, OphirFrieder, Springer.
- Information Retrieval: Data Structures and Algorithms by Frakes, Pearson.

5. **Course Objectives**

- Understanding the basics of Information retrieval like what is a corpus, what is precision and recall of an IR system
- Understanding the data structures like Inverted Indices used in Information retrieval systems
- Understanding the basics of web search
- Understanding the different techniques for compression of an index including the dictionary and its posting list
- Understanding the different components of an Information retrieval system
- Developing the ability of develop a complete IR system from scratch

6. **Class/Laboratory Schedule**

Lectures : 3 1-hr lectures per week

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

Lecture: Students learn about developing the various aspects of a complete Information Retrieval System

8. **Evaluation of Students**
The instructor uses the following methods: home-work assignments, 2 sessional exams, end-semester exam and Study of research papers or implementations of learnt techniques in Information retrieval, one-on-one discussions during office hours, internal evaluation test.

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

The correlation of the COs of the course Information Retrieval 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 indicates that there is no correlation between the COs to a particular PO.

Correlation of COs of Information Retrieval Course

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	L		H	H	H	M	M	M	L	M

Course Code and Title
CSL407 : Data Mining and Warehousing (DMW)

1. **Course Description**

   Concept of Data mining and warehousing, applications to real life examples. The study of data warehousing and various data mining tools.
   3 lectures per week.   Credit scheme - (L-T-P-C: 3-0-0-6)

2. **Required Background or Pre-requisite:** CSL403 : Database Management Systems

3. **Detailed Description of the Course**

   - Introduction to Data Mining and warehousing, real time applications, scope of mining and warehousing for various applications.   (1 week)
   - Data warehousing- Various schema, three-tier architecture, design issues, multidimensional model.   (2 week)
   - Data warehouse development life cycle, Data warehouse analysis, CUBE, ROLL UP and STAR queries.   (2 week)
   - Data Warehouse Design **-** Massive de-normalisation, STAR schema design , Data ware house Architecture, OLAP, ROLAP and MOLAP , concepts of Fact and dimension table

                                                                                (2 week)

   - Space Management in Data warehouse - Schemas for storing data in warehouse using different storage structures, B-tree index, hash index, clusters, Bitmap index functional index, domain index, Data partitions.   (3 week)

   - Performance and Tuning - Query optimization, memory management, process management. I/o management for Data warehouse.   (2 week)

   - Data Mining Tools - Association Rules , A priori Algorithms, Fp-trees Algorithms,Constraints and solution.   (1 week)

   - Cluster Analysis – Paradigms , DBSCAN , Cluster algorithms.   (1 week)

   - Mining Tools - Decision Trees and applications.   (1 week)

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

   - **Data mining -** Concepts & Techniques, Jiawei Han, Micheline Kamber, Morgan Kaufmann ,2nd Ed.2006.
   - **Oracle 8i Data Warehousing,** Michale Corey, Michale Abbey, Tata McGraw Hill
   - **Fundamentals of Database Systems,** Navathe and Elmasry, Addison Wesley, 2000
   - **Data Mining,** Arun Pujari Orient Longman, 2003

5. **Course Objectives**

   - Identify the scope and necessity of Data Mining & Warehousing for the society.

   - Describe the designing of Data Warehousing so that it can be able to solve the root problems.

   - To understand various tools of Data Mining and their techniques to solve the real time problems.

- To develop ability to design various algorithms based on data mining tools.
- To develop further interest in research and design of new Data Mining
- techniques.

6. **Class Schedule**

   Lectures : 3 1-hr lectures per week

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

   Lecture: Students should know about design issues of data warehousing, learn various mining tools, able to identify the real time problems and able to design solution using various mining tools, further take the R&D interest and try to contribute some new methods to the area.

8. **Evaluation of Students**
   The instructor uses the following methods: 2 sessional exams, end-semester exam, class test, some real time problems as programming assignments.

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

   The correlation of the COs of the course Artificial Intelligence 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 Data mining & Warehousing

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	L		H	H	H	M	H	L	L	H

Course Code and Title
CSL409 : Topics in 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: 3-0-0-6)

2. **Required Background or Pre-requisite:** CSL312 : Operating Systems

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, Frankin'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 – Lamport Shostak Pease Algorithm using Oral Messages, Agreement using Signed Messages   (1 week)

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 experimental evaluation.

6. **Class Schedule**

Lectures : 3 1-hr lectures 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.

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 Topics in 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
H	H		H	H	H	M		M	L	L	

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

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

- 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 understand the modelling and adaptation of techniques for solution of these problems.
- There are some courses where the students are given knowledge about the social, professional, and ethical issues so that they are able to better integrate when they join an industry.
- In the seventh and the eighth semester, the students have to work in a team on a project in a team to build a substantially large system or to come up with a new algorithmic technique to address a specific problem. This gives them the ability to gather and understand new knowledge, extended the existing techniques, build an entire system. Moreover, they understand the importance of working cooperatively and responsibly in teams.

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

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

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 addition 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-tunes 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 group of students working on a project, prepare a poster in which they describe the problem on which they would be working. They present existing work on them and discuss their approach. 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 is typically people from the industry or academia having about 10 years of experience. This helps in the achievement of POs 1, 2, 4, 8, 9, 10, and 11.

The indirect assessment methods are the following.

1. At the end of the second year, many industries come to the campus for recruitment as interns for the students. They conduct a written test and an interview of the students. After this, the faculty discusses with the industry colleagues regarding the progress of the students.
2. The students participate and also organise different programming contests in which they try to solve problems available in code chef or the previous ACM ICPC contests.
3. 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 the laboratory and project course work are contributing towards attainment of the POs (10)

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

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 programming languages and other existing tools. Using these, they gain the experience of the entire software engineering lifecycle.

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

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

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

Include information on: (50)

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

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 (50)
c) The expected level of attainment for each of the program 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)

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

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

2.4.2. Indicate how results of evaluation used for improvement of course delivery and assessment (10)
(Articulate with rationale the curricular delivery and assessment improvements 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. Due to student feedback, most of the course material is covered through the chalk and blackboard method instead of using the LCD projector and slides.

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

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.

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

3 Programme Curriculum (125)
3.1. Curriculum (20)

3.1.1. Describe the Structure of the Curriculum (5)

Course Code	Course title	Lecture (L)	Tutorial (T)	Practical[#] (P)	Total Hours	Credits
....	....					
MAL 205	Numerical Analysis and Probability Theory	3	0	0	3	6
ECL 2xx	Digital Circuits and Logic Design	3	0	0	3	6
EEL 2xx	Electrical Sciences	3	0	0	3	6
CSL 202	Discrete Mathematics and Graph Theory	3	1	0	4	8
CSL 213	Data Structures and Program Design I	3	0	2	5	8
CSP224	Software-Lab-I	0	0	2	2	2
ECL 2xx	Analog Circuits (Elective)	3	0	0	3	6
CSL 222	Computer Organization	3	0	0	3	6
MAL 206	Linear Algebra and Applications	3	0	0	3	6
CSL 214	Data Structures and Program Design II	3	0	2	5	8
CSL 204	Concepts in Programming Languages	3	0	2	5	8
CSL 223	Microprocessor-based Systems	3	0	2	5	8
CSL 222	Computer Organization	3	0	0	3	6
EEL 2xx	Control Systems (Elective)	3	0	0	3	6
ECL2xx	Signals and Systems (Elective)	3	0	0	3	6
CSL 307	Theory of Computation	3	0	0	3	6
CSL 312	Operating Systems	3	0	0	3	6
CSL 313	Analysis of Algorithms	3	0	0	3	6
CSL 303	Introduction to OO Methodology	3	0	2	5	8
CSP 314	Software Lab II	0	0	2	2	2
CSL 306	System Programming	3	0	2	5	8
CSL 304	Neurofuzzy Techniques (Elective)	3	0	0	3	6
CSL 305	Computer Graphics (Elective)	3	0	0	3	6
CSL 315	Database Management Systems	3	0	2	5	8
CSL 316	Language Processors	3	0	2	5	8
CSL 308	Software Engineering	3	0	0	3	6
CSL 317	Computer Networks	3	0	2	5	8
HUL 301	Technical Communication	3	0	0	3	6
CSD 401	Project Phase I	0	0	4	4	4
CSP438	Software Lab – III	0	0	2	2	2
CSL 408	Topics in Embedded Systems (Elective)	3	0	0	3	6
CSL 412	Artificial Intelligence (Elective)	3	0	2	5	8
CSL522	Advances in Compilers (Elective)	3	0	2	5	8
CSL517	Pattern Recognition (Elective)	3	0	2	5	8
CSL436	Information Retrieval (Elective)	3	0	0	3	6
CSL523	Advanced Computer Architecture (Elective)	3	0	0	3	6
ECL4xx	Digital Signal Processing (Elective)	3	0	0	3	6
CSD 402	Project Phase II	0	0	8	8	8
CSL 406	Network Security (Elective)	3	0	0	3	6
CSL 407	Data Mining and Data Warehousing (Elective)	3	0	0	3	6
CSL 410	Topics in Graph Theory (Elective)	3	0	0	3	6
CSL 409	Topics in Distributed Systems (Elective)	3	0	0	3	6
CSL 437	Software Project Management (Elective)	3	0	0	3	6
	TOTAL	104	2	34	140	242

\# : Seminars, project work may be considered as practical

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

(Draw the schematic of the prerequisites of the courses in the curriculum)
In section 2.2.1 of the SAR, for each course, the pre-requisites, the syllabus, and other details are mentioned.

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

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

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

Programme curriculum grouping based on different components

Course Component	Curriculum Content (% of total number of credits of the program)	Total number of contact hours	Total number of credits	POs	PEOs
Mathematics	13%	21	42	1, 2, 7, 11	1, 2, 4, 5
Sciences	25%	40	80	1, 2, 7, 10, 11	1, 2, 5, 6, 7
Computing	2.5%	5	8	1, 2, 3, 4	2, 3
Humanities	4%	6	12	10, 11, 12	6, 7
Professional core	55.5%	116	178	All	All

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

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

In Section 2.2.1, all the courses of the program (including the electives), their curricula, their objectives, evaluation methods, etc. are listed.

3.4. Industry interaction/internship (10)
(Give the details of industry involvement in the programme such as industry-attached laboratories and partial delivery of courses and internship opportunities for students)

1. The department has a project sponsored by IBM, with which a cloud computing laboratory would be set up.

2. Some of the courses e.g. Introduction to Object-Oriented Methodology, System Programming, Introduction to Programming using C, Microprocessors, and Enterprise Resource Planning have been delivered by colleagues from the industry.
3. Every year many industries, e.g. M/s Office Box systems, M/s Vaultize Inc., come directly to the Department for internship opportunities for the students. On an average, about 10 students are able to avail internship opportunities through this method.
4. The Training and Placement Department regularly organizes internship opportunities for the third year students. Typically, the companies who come for recruitment, also provide a few internship positions.
5. In addition to this, many students approach different industries and are able to get an internship position.

3.5. Curriculum Development (15)

3.5.1. State the process for designing the programme curriculum (5)
(Describe the process that periodically documents and demonstrates how the programme curriculum is evolved considering the PEOs and the POs)

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 detail in the Board of Studies (BOS) meeting for any modifications. Finally, the recommendation of the BOS is placed before the Senate for approval.

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

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

3.6. Course Syllabi (5)

(Include, in appendix, a syllabus for each course used. Syllabi format should be consistent and shouldn't exceed two pages.)
The syllabi format may include:
- Department, course number, and title of course
- Designation as a required or elective course
- Pre-requisites
- Contact hours and type of course (lecture, tutorial, seminar, project etc.,.)
- Course Assessment methods(both continuous and semester-end assessment)
- Course outcomes
- Topics covered
- Text books, and/or reference material

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

4. Students' Performance (75)

Admission intake in the programme

Item	CAY	CAY*m1*	CAY*m2*	CAY*m3*
Sanctioned in take strength in the program me (*N*)	92	92	92	92
Total number of admitted students in first year *minus* Number of students migrated to other	92	91	89	91
Number of admitted students in2ndyearinthesamebatch via lateral entry(*N2*)	NA	NA	NA	NA
Total number of admitted students in the program me (*N1*+*N2*)	92	91	89	91

4.1. Success Rate (20)

Provide data for the past seven batches of students

Year of entry (in reverse chronological order	Number of Students admitted in 1st year + admitted via lateral entry in 2nd year (N1+N2)	Number of students who have successfully completed[*]			
		1st year	2nd Year	3rd Year	4th Year
CAY	92	-	-	-	-
CAYm1	91	81out of 102	-	-	-
CAYm2	89	82 out of 98	77 out of 94	-	-
CAYm3	91	68 out of 104	60 out of 100	70 out of 100	-
CAYm4(LYG)	81	65 out of 89	48 out of 86	58 out of 86	59 out of 83
CAYm5(LYGm 1)	70	53 out of 77	58 out of 80	68 out of 80	61 out of 79
CAYm6(LYGm 2)	60	45 out of 71	41 out of 69	53 out of 67	53 out of 66

Note: N1+N2 is added with DASA students

[*]successfully completed implies zero backlogs

Success rate= 20×meanofsuccessindex(SI)for past three batches

SI= (Number of students who graduated f r o m the programme in the stipulated

period of course duration)/(Number of students admitted in the first year of that batch and admitted in 2nd year via lateral entry)

Item	LYG (CAYm4)	LYGm1 (CAYm5)	LYGm2 (CAYm6)
Number of students admitted in the corresponding First Year + admitted via lateral entry in2ndyear	81	70	60
Number of students who have graduated in the stipulated period	59	61	53
Success index(SI)	0.73	0.87	0.88

Average SI=.0.83 Success rate =20×AverageSI=.16.53

4.2. Academic Performance (20)

Academic Performance = 2 * API
Where API = Academic Performance Index= Mean of Cumulative Grade Point Average of all successful Students on a 10 point CGPA System
OR = Mean of the percentage of marks of all successful students / 10

Item	LYG (CAYm4)	LYGm1 (CAYm5)	LYGm2 (CAYm6)
Approximating the API by the following mid-point analysis			
9 < Number of students with CGPA < 10.0	2	8	2
8 < Number of students with CGPA < 9.0	8	11	9
7<=8	25	24	24
6<=7	14	21	12
5<=6	1 7	9	1 2
Total	66	73	59
Approximating API by Mid-CGPA	456	535.5	419.5
Mean of CGPA/Percentage of all the students (API)	6.95	7. 3	7.11

Av. API = Academic Performance = 2 x Av. API = 14.26

4.3   Placement and Higher Studies (20)

Assessment Points = 20 × (x + 1.25y)/N

where, x= Number of students placed

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

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

Item	LYG	LYG$m1$	LYG$m2$
Number of admitted Students corresponding to LYG including lateral entry(N)	81	70	60
Number of students who obtained Jobs as per the record of placement office($x1$)	48/56	58/70	51/58
Number of students who found employment otherwise at the end of the final year($x2$)	--	--	--
$x=x1 +x2$	--	--	--
Number of students who opted For higher studies with valid qualifying scores/ ranks (y)	--	--	--
Assessment point^K	--	--	--

Average assessment points= --

4.4   Professional Activities (15)

4.4.1 Professional Societies / Chapters and organizing engineering events

1. Student ACM chapter is active for more than last 5 years.
2. Students regularly arrange for programming competitions, webinars, guest lectures and student workshops.
    a. 4 department-level online programming competitions arranged during July13- November'13.
    b. For last 3 years, IBM webinars' telecast organized by students.
    c. Lecture by Prof. Ramesh Jain on "Social Networking Applications" organized in 2012.
3. Students involved with organizing technology event AXIS that is inter-university technology festival. This includes programming competitions organized by Computer Science students.

4.4.2 Organization of Paper Contest, design contest, etc and achievements

4.4.3 Publication of technical magazines, newsletters etc

4.4.4. Entrepreneurship initiative, product designs and innovations

4.4.5 Publication and awards in inter-institute events by students of the program of study

- 4 papers and 1 poster in international conferences
  - 4 Papers in International Conferences
    - "Technology Enabled Assessment Environment Technology Enabled Assessment Environment" at International Conference on Technology for Education IASTED
    - "A Map Reduce based hybrid genetic algorithm using island approach for solving time dependent vehicle routing problem" at International Conference on Computer & Information Sciences ICCIS Kualalumpur, June 2012
    - "Iterative mapreduce based heuristic algorithm for solving N Puzzle" at International Conference on Computer & Information Sciences ICCIS Kualalumpur, June 2012
    - "Layered filtering technique for content based video retrieval", at International Conference on Computer & Information Sciences ICCIS Kualalumpur, June 2012
  - Poster presentation "Hierarchical Action Selection for Rein- forcement Learning in Infinite Mario" by Mandar Joshi, Rakesh Khobragade, Saurabh Sarda, and Shiwali Mohan, in 20th European conference on Artificial Intelligence, France, August 2012.
- In December 2010, 1 team was selected for the 2nd round national level ICPC onsite competition.
- In December 2011, 2 teams were selected for the 2nd round national level ICPC onsite competition. 1 team was ranked in the top 20 teams at the national level.
- In December 2012, 3 teams were selected for the 2nd round national level ICPC onsite competition.
- In December 2013, 6 teams are selected for the 2nd round national level ICPC onsite competition.
- In 2011, 2 teams were selected in top 100 nationally, in IBM Technology Web Contest 2011.

5. Faculty Contributions (175)

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	IPRs	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		-	-	-
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	No	Appoved Ph.D. guide in RTMNU, expert member of NBA, member of faculty selection committees at various institutes
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)	Nil	Industrial Consultancy, Delivering Expert lectures

Name	Qualification	Designation								
U. A. Deshpande	PhD, IIT Kharagpur, 2005	Associate Professor, 22/07/ 1996		50	50	13	-	Rs. 33 Lakh (joint)	No	R&D Project with IBM Consultancy Project with Tata Capital
A.S. Mokhade	M.Tech, IITB, 1988	Associate Professor, 23/08/ 1996	50%	25%	25%	05		Rs. 120Lakhs (joint)		Delivering Expert lectures
Ravindra Keskar	M.Tech. IIT, Mumbai, 199.	Associate Professor, 01/01/ 2009 (joined as Asstt. Prof).		66%	33%			Consultancies with Persistent Systems, MADC and Tata Capital. Total amount - Rs. 6.20 Lakhs		University Relations Interaction with IBM, SUR grant project with IBM, Tracking/arranging activities under MoU with Persistent Systems.
M. P. Kurhekar	M.Tech. (CSE), IIT Mumbai, 1999	Associate Professor, 12/07/ 2010		75%	25%	Conference- 01	Nil	1. Persistent Systems Pvt. Ltd. (Rs. 1.75 Lakhs) and 2. Tata Innovations Funds (Rs. 3 Lakhs) (with Prof. U.A. Deshpande and Prof. R.B. Keskar)	Nil	IBM SUR Funding for Cloud Computing ($15,000)
M. M. Dhabu	M. E, Amravati University, 2005	Assistant Professor, 22/05/ 2006		75	25	03				
Tiwari	M.E., MNNIT Allahabad, Graduation 1998	Assistant Professor, 25/05/ 2006	0	80	20	2	-	-	-	-
S. A. Raut	M.E. (CSE) Amravati University, 2005	Assistant Professor, 24/11/ 2008	-	100	-	04				
Mrs Deepti Shrimankar	M.Tech, Nagpur University, 2007	Assistant Professor 26/11/ 2008	39%	61%		08				

M.A. Radke	M.S.(CSE) University of Merryland, Boltimore county, 2008	Assistant Professor, 24/04/ 2012	-	50	50			-	-		-	-
Kavita Kathe	M.Tech, VNIT, 2012	Teaching Asst.		100%								
Mrs. Saroj Bhagchandani	M.E. Nagpur University, 2009	Teaching Asst.	100%									
Varsha Dhote(Pandagre)	M.Tech. , L.N.C.T./ RGPV University, Bhopal 2013	Teaching Asst.	100%									
Anita Ahirwar	M.Tech, NIT, Raurkela, 2013	Teaching Asst.	100%									
Renuka Gowardhan	M.Tech, CSVTU,Bhilai, 2013	Teaching Asst.	100%									

(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)

STR is desired to be 15 or superior

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

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

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

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

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

$N1$ = Total number o f faculty members in the programme (by considering fractional load)

Year	x	y	Z	$x + y + z$	$N1$	STR	Assessment (max.= 20)
CAY$m2$	100	100	104	304	16	19	15.78
CAY$m1$	109	94	98	301	14	21.5	13.95
CAY	110	90	102	302	17	17.8	16.85
					Average assessment		15.53

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

N = Maximum {N1, N2}

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

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

Year	N1	N2	N=Max.(N1, N2)
CAY$m2$	15	20	20
CAY$m1$	14	20	20
CAY	17	20	20

5.2. Faculty Cadre Ratio (20)

Assessment $= 20 \times CRI$

where, CRI $=$ Cadre ratio index

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

where, $\quad$ x $\quad =$ Number of professors in the programme

$\quad$ y $\quad =$ Number of associate professors in the programme

Year	x	y	N	CRI	Assessment
CAY$m2$	03	05	20	1.23	24.6
CAY$m1$	03	05	20	1.23	24.6
CAY	03	05	20	1.23	24.6
				Average assessment	24.6

5.3. Faculty Qualifications (30)

Assessment	=	3* FQI
Where CRI	=	Faculty Qualification Index
	=	$(10x+6y+4z_O)/N2$
		Such that , $x+y+z_O <= N2$; and $z_O <= z$
Where x	=	Number of Faculty members with PhD
y	=	Number of Faculty members with ME/M.Tech
z	=	Number of Faculty members with BE/B.Tech

	x	y	N	z	FQ	Assessment
CAY$m2$	5	7	20	4	100	300
CAYm1	5	9	20	0	104	312
CAY	5	12	20	0	122	366
					Average assessment	326

5.4. Faculty Competencies correlation to Programme Specific Criteria (15)
(Provide evidence that program curriculum satisfies the applicable programme criteria specified by the appropriate American professional associations such as ASME, IEEE and ACM. You may list the programme specific criteria and the competencies (specialisation, research publication, course developments etc.,) of faculty to correlate the programme specific criteria and competencies)

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. 5perfaculty		
	CAY$m2$	CAY$m1$	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 for an STR of15)	20	20	20
Assessment=3 ×Sum/N	3	2.55	3
Average assessment			2.85

5.6. Faculty Retention (15)

Assessment $= 3 \times$ RPI/N
Where RPI $=$ Retention point index
$=$ Points assigned to all
faculty members

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

Item	CAYm2	CAYm1	CAY
Number of faculty with experience of less than 1 year (X_0)	03		03
Number of faculty with 1 to 2 years experience	01	01	01
Number of faculty with 2 to 3 years experience	01	02	
Number of faculty with 3 to 4 years experience	01	01	01
Number of faculty with 4 to 5 years experience			02
Number of faculty with more than 5 years experience (X_5)	10	10	10
N	20	20	20
RPI = X1+2X_2 + 3X_3 + 4X_4 + 5X_5	56	58	62
Assessment	8.4	8.7	9.3
Average assessment			8.8

5.7. Faculty Research Publications (FRP) (20)

Assessment of FRP = 4 × (Sum of the research publication points scored by each faculty member)/N
(Instruction: A faculty member scores maximum five research publication points
depending upon the quality of the research papers and books published in the past three
years.)

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

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

Name of faculty (contributing to FRP)	FRP points (Max. 5 per faculty)		
	CAYm2	CAYm1	CAY
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 for an STR of15)	20	20	20
Assessment o f FRP=4 ×Sum/N	2.4	2.4	2.2
	Average assessment		2.33

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, P.S.Deshpande	International Conference on Computer and Information Sciences 2012, Universiti Teknologi PETRONAS 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 Workstations using OpenCL and MP	Krishnahari Thouti, S.R.Sathe	International Journal of Computer Applications Vol.77(9):31-36, September 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, 6-8, 2012, pp. 126-131.
15	Solving N-Queens Problem on GPU Architecture using OpenCL with Special Reference to Synchronization Issues	Krishnahari Thouti, S.R.Sathe	IEEE 2nd International Conf. on 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

17	Achieving Excellence in Research with Problem-Solving Attitude and Techno-Managerial Approach-Refreshing Lessons for Leadership in Higher Education	Anil S. Mokhade	Association of Computer Science and Information Technology 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)

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

Name of faculty (contributing to FIRP)	FRP points (Max. 5 per faculty)		
	CAYm2	CAYm1	CAY
Sum N			
Assessment FIPR = 2x Sum/N			
Average assessment			

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

Assessment of R&D and consultancy projects = 4 × (Sum of FRDC by each faculty member)//N

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

Five points for funding by national agency,

Four points for funding by state agency,

Four points for funding by private sector, and

Two points for funding by the sponsoring trust/society.

Name of faculty (contributing to FRDC)	FRDC 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.Keskaar	4		
U.A. Deshpande, R.B.Keskaar M. P.Kurhekar			2
M.P.Kurhekar & R.B.Keskar			2
Sum	9	9	8
N	20	20	20

Assessment FPPC = 4x Sum/N

Average assessment			1.73

5.10. Faculty Interaction with Outside World (10)

FIP = Faculty interaction points

Assessment = 2 × (Sum of FIP by each faculty member)/N
(Instruction: A faculty member gets maximum five interaction points, depending upon the type of institution or R&D laboratory or industry, as follows)

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

Three points for interaction with institution/industry (not covered earlier).
Points to be awarded, for those activities, which result in joint efforts in publication of books/research paper, pursuing externally funded R&D / consultancy projects and/or development of semester-long course / teaching modules.

Name of faculty (contributing to FIP)	FIP points		
	CAYm2	CAYm1	CAY
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 FIP = 2x Sum/N	0.3		0.9
	Average assessment		0.4

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 (20)

6.1.1. Adequate number of rooms for lectures (core/electives), seminars, tutorials, etc., for the program (10)
(Instruction: Assessment based on the information provided in the preceding table.)

6.1.2. Teaching aids☐☐☐multimedia projectors, etc. (5)
(Instruction: List the various teaching aids available)

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

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

6.2. Faculty Rooms in the Department (15)

6.2.1. Availability of individual faculty rooms (5)
(Instruction: Assessment based on the information provided in the preceding table.)

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

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

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

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

The following table is required for the subsequent criteria.

Lab Description in the Curriculum	Exclusive use/ Shared	Space, Number of Machines	Number of Experiments Students	Quality of Instruments	Lab 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 Curriculum Requirements and the POs (25)

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

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

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

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

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

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

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

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

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. Bhivgade	Technical Officer	Exclusive	09/03/1995	B.E.	M.Tech DBM	1) Attended workshops/conferences (National-International Conference in parallel Computing(Cluster and Grid parallel Computing) 2) Published papers in refereed conferences/ conferences and book chapter in fault tolerant in parallel systems like grid and cluster 3) CCNA Networking Technical Training, java and other technical related courses. Self study for Joomla , word press and model, etc.	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 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.Warthi	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)
(Instruction: Assessment based on the information provided in the preceding table.)

6.4.2. Incentives, skill, upgrade, and professional advancement (5)
(Instruction: Assessment based on the information provided in the preceding table.)

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

Students' Admission

Admission intake (for information only)

Item	CAY	CAYm1	CAYm2	CAYm3
Sanctioned Intake Strength in the Institute (N)	738	738	738	652
Number of students admitted on merit basis (N1)	713	724	713	617
Number of students admitted on management quota / otherwise (N2)	48	14	45	54
Total number of admitted students in the Institute (N1+N2)	761	738	758	671

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

Admission quality (for information only)

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

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

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

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

List of faculty members teaching first year courses:

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

19	Dr. K. Mohan Kant	Ph.D/M.Sc./M.Tech	Assistant Professor	14/06/12	Applied Physics	71.5	--	28.5
20	Dr. G.P. Singh	Ph.D.	Professor	27/03/95	Mathematics	15	35	50
21	Dr. P. Pramod Chakravarthy	Ph.d.	Associate Professor	31/05/06	Mathematics	25	25	50
22	Dr. M. Devakar	Ph.D.	Assistant Professor	24/11/08	Mathematics	25	25	50
23	Dr. Pallavi Mahale	Ph.D.	Assistant Professor	27/11/08	Mathematics	--	50	50
24.	Dr. G. Naga Raju	Ph.D.	Assistant Professor	1/7/10	Mathematics	25	25	50
25.	Dr. R. P. Pant	Ph.D.	Assistant Professor	25/6/12	Mathematics	25	25	50
26	Dr. Pradip Roul	Ph.D.	Assistant Professor	13/8/12	Mathematics	25	25	50
27	Dr. Malabika Adak	Ph.D.	Teaching Assistants	16/7/13	Mathematics	40	20	40
28	Mrs. Shweta Jain	M.Phil	Teaching Assistants	17/7/13	Mathematics	40	20	40
29	Mr. Mohd. Ahmed	M.Sc.	Teaching Assistants	18/7/13	Mathematics	50	50	--
30	Mr. Pravin Sayre	M.Sc.(Net Qualified)	Teaching Assistants	16/7/13	Mathematics	75	25	--
31	Mr. Samala Ratan	M.Sc.	Teaching Assistants	22/7/13	Mathematics	100	--	--
32	Mr. S. R. Bhide	Ph.D.	Associate Professor	12/7/84	Electrical Engg.	12	56	32
33	Mr. Prasad Venikar	(Research Scholar)		09/07/12	Electrical Engg.	46.15	53.84	--
34	Mr. S. S. Bhatt	Ph.D.	Associate Professor	01/04/87	Electrical Engg.	33.33	48.15	18.51
35	Mr. M. Irfan	(Research Scholar)		01/07/11	Electrical Engg.	21.43	78.57	--
36	Mr. V. B. Borghate	Ph.D.	Associate Professor	01/08/85	Electrical Engg.	25.93	55.56	18.52
37	B. S. Umre	Ph.D.	Associate Professor	02/07/84	Electrical Engg.	14.82	74.7	11.11
38	M. A. Choudhary	Ph.D.	Associate Professor	17/07/08	Electrical Engg.	14.82	55.56	29.63
39	P. S. Kulkarni	Ph.D.	Associate Professor	16/03/95	Electrical Engg.	32.14	53.57	10.71
40	M. R. Ramteke	Ph.D.	Associate Professor	05/03/95	Electrical Engg.	33.33	55.56	11.11
41	A. S. Junghare	Ph.D.	Associate Professor	07/03/95	Electrical Engg.	16.00	84.00	--
42	S. R. Tambay	Ph.D.	Associate Professor	03/08/81	Electrical Engg.	7.41	2.96	29.62
43	V. S. Kale	Ph.D.	Associate Professor	01/12/99	Electrical Engg.	14.82	62.96	22.22

44	N. R. Patne	Ph.D.	Lecturer	18/05/06	Electrical Engg.	31.03	68.96	--
45	H. M. Suryawanshi	Ph.D.	Professor	11/07/89	Electrical Engg.	11.11	33.33	55.55
46	M. V. Aware	Ph.D.	Professor	17/12/90	Electrical Engg.	00.00	72.22	27.78
47	S. Patnaik	Ph.D.	Associate Professor	01/06/12	Electrical Engg.	25.93	62.96	11.11
48	R. J. Satputaley	M.Tech.	Assistant Professor	18/07/08	Electrical Engg.	31.03	58.62	10.34
49	A. Dhabaley	M.Tech.	Assistant Professor	16/05/05	Electrical Engg.	27.59	44.83	27.59
50	M. S. Ballal	Ph.D.	Associate Professor	04/04/12	Electrical Engg.	14.82	85.19	--
51	Sathyan	Ph.D.		09/07/12	Electrical Engg.	46.15	53.84	--
52	D. Khare	Ph.D.		01/01/13	Electrical Engg.	61.54	38.46	--
53	Amarendra	Ph.D.		01/07013	Electrical Engg.	76.92	23.08	--
54	M. Thakre	Ph.D.		03/01/12	Electrical Engg.	61.54	38.46	--
55	M. Pandey	Ph.D.			Electrical Engg.	66.62	33.33	--
56	Rambabu	M.Tech.		16/07/13	Electrical Engg.	64.5	35.5	--
57	Ashok Kumar	M.Tech.		16/07/13	Electrical Engg.	64.5	35.5	--
58	Chandra Sekhar	M.Tech.		16/07/13	Electrical Engg.	00	100	--
59	Dr. S. V. Bopshetty	Ph.D	Associate Professor	18/07/80	Mech. Engg.	30	30	30
60	Dr. A. B. Andhare	Ph.D.	Associate Professor	31/07/08	Mech. Engg.	0	0	30
61	Mr. M. S. Kotambkar	M.Tech.	Assistant Professor	27/7/06	Mech.Engg.	55	55	55
62	Mr. A. A. Thakre	M.Tech.	Assistant Professor	03/08/06	Mech. Engg.	50	50	50
63	Mr. P. V. Kane	M.Tech.	Assistant Professor	02/12/08	Mech.Engg.	45	45	45
64	Dr. L. M. Gupta	Ph.D.	Professor	18/10/89	Applied Mechanics	11	47	42
65	Dr. M. M. Mahajan	Ph.D.	Professor	17/08/92	Applied Mechanics	0	65	35
66	Dr. R. K. Ingle	Ph.D.	Professor	14/09/92	Applied Mechanics	10	30	60
67	Dr. G. N. Ronghe	Ph.D.	Professor	01/07/89	Applied Mechanics	0	32	68
68	Dr. O. R. Jaiswal	Ph.D.	Professor	30/10/98	Applied	37	47	16

					Mechanics			
69	Dr. R. S. Sonparote	Ph.D.	Associate Professor	11/08/92	Applied Mechanics	9	56	35
70	Dr. S. V. Bakre	Ph.D.	Professor	16/05/06	Applied Mechanics	23	35	42
71	Dr. Sangeeta Gadve	Ph.D.	Associate Professor	08/06/12	Applied Mechanics	75	0	25
72	Dr. D. Datta	Ph.D.	Assistant Professor	15/06/10	Applied Machanics	54	15	31
73	Dr. Ratnesh Kumar	Ph.D.	Assistant Professor	17/04/12	Applied Machanics	57	14	29
74	Mr. S. B. Borghate	M.Tech.	Assistant Professor	30/08/98	Applied Machanics	31	54	15
75	Mr. A. Y. Vyavhare	M.Tech.	Assistant Professor	14/06/06	Applied Machanics	26	59	15
76	Mr. A. P. Khatri	M.Tech.	Assistant Professor	28/11/08	Applied Machanics	100	0	0
77	Dr. M. Ghosal	Ph.D.	Associate Professor	16/08/88	Humanities & S. Science	11.11	--	88.89
78	Dr. G. N. Nimbarte	Ph.D.	Associate Professor	24/11/8	Humanities & S. Science	100	--	--
79	Radhika Sudhir	M.A.	Teaching Assistant	27/07/13	Humanities & S. Science	100	--	--
80	Navneet Utlawar	M.A.	Teaching Assistant	19/07/13	Humanities & S. Science	100	--	--
81	Priyanka Bansod	M.A.	Teaching Assistant	15/07/13	Humanities & S. Science	100	--	--
82	A. S. Mokhade	M.Tech.	Associate Professor	00/08/96	Computer Science & Engineering	50	25	25
83	Mrs. Deepti Shrimankar	M.Tech.	Assistant Professor	26/11/08	Computer Science & Engineering	39	61	
84	Mrs. Saroj Bhagchandani	M.E.	Teaching Assistant	00/07/13	Computer Science & Engineering	100	--	--
85	Varsha Dhote (Pandagre)	M.Tech.	Teaching Assistant	00/8/13	Computer Science & Engineering	100	--	--
86	Anita Ahirwar	M.Tech.	Teaching Assistant	00/7/13	Computer Science & Engineering	100	--	--
87	Renuka Gowardhan	M.Tech.	Teaching Assistant	00/7/13	Computer Science & Engineering	100	--	--

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

7.1. Academic Support Units (35)

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

Data for first year courses to calculate the FYSTR:

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

= 10.00

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

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

x   =Number of faculty members with PhD

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

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

N   = Number of faculty members needed for FYSTR of 25

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

Max = 15

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

Lab Description	Space, Number of students	Software used	Type of Experiments	Qualify of Instruments	Lab Manuals
First Year Basic Electrical Engineering Lab. (EEP101)	100 square meters Around 18 students per practical batch	This is a hardware laboratory	Hands-on experiment where students first wire-up and then conduct the experiment. Experiments are designed	Good quality instruments are used. Adequate numbers of instruments are available.	Lab manuals are available for all the experiments.

			to verify circuit laws and demonstrate and reinforce concepts taught in theory classes		
B.Tech First Year General Lab	Two labs For General and optics experiments separately	NIL Demonstration through LCD Projector	Basic General Physics Experiments	Adequate Quality Four SET for each experiment	Yes, for each experiments
B.Tech 1st Year General Lab	One general Lab covers all experiment	Nil	Basic General Applied Chemistry Experiments	Adequate & High Quality Ample sets for each experiment	Yes, for each experiment.
Engineering Drawing Lab.	Three classrooms (each 400 sq-feet area 18 students in each batch Four batches for each section.	Nil	Sheet Work	Wooden Models	NA
Computer Programming Lab	2000 Sq.Ft 20	Turbo C	Programming	Available and adequate	Available and adequate

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

7.1.4. Language laboratory (2)

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

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

7.2. Teaching - Learning Process(40)

7.2.1. Tutorial classes to address student questions: size of tutorial classes, hours per subject given in the timetable (5)
- Size of Tutorial class -- **26 students (x 4 batches)**
- Provision of tutorial classes in timetable – **YES**
- Tutorial sheets provided – **YES (Problem-sheets provided**)
- Tutorial classes taken by – **Faculty**
- Number of tutorial classes per subject per week – **1 Hr per batch**
- Number of students per tutorial class – **26 students (x 4 batches)**
- Number of subjects with tutorials – **2nd year – 1 subject (Discrete Maths and Graph theory)**
- Impact of Tutorial classes -
  - **Passing %age increased by around 15%**
  - **The number of students taking re-exam has reduced**

Number of subjects with tutorials – Last year ….2nd year…..4th year
(Instruction: Here the institution may report the details of the tutorial classes that are being conducted on various subjects and also state the impact of such tutorial classes.)

7.2.2. Mentoring system to help at individual levels (5)
Type of mentoring: Professional guidance / career advancement / course work specific / laboratory specific / total development

Number of faculty mentors   --   **11**
Number of students per mentor   --   **30**
Frequency of meeting   --   **At-least 2 times per year**
(Instruction: Here the institution may report the details of the mentoring systemthat has been developed for the students for various purposes and also state the efficacy of such system).

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

Feedback collected for all courses: **YES**
Specify the feedback collection process: **By filling feedback form from students**
Percentage of students participating: **Almost 100%**
Specify the feedback analysis process: **By generating statistics using grade points**
Basis of reward / corrective measures, if any: **Corrective action taken according to feedback**
Number of corrective actions taken in the last three years:

1. Installing sound system to cater large classroom.

2. Improvement in lesson plan.

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

7.2.4. Scope for self-learning (5)

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

- **Industry expert talks are arranged regularly on different topics on advances in technology**
  - **In 2013, different talks were arranged on Cloud computing and Hadoop, Meta-Language for design, Futute of Internet, Advanced Compiler Techniques, delivered by industry and external academic experts.**
- **Workshops are arranged on different topics**
  - **In 2013, in association with ACM chapter, a workshop on "Business Analytics" was aranged**
- **Industry webinars are arranged in the department**
- **Online availability of NPTEL videos on institute server**

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

➜ **Online availability of NPTEL videos on institute server**

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

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

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

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

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

- **Programming club for students of Computer Science and Engineering, arranges regular online programming competitions.**
- **ACM students' chapter, arranges student workshops, webinars, guest lectures, alumni interaction etc.**
- **Technology festival AXIS – students organize different competitions including programming/technical design competition.**
- **Cultural festival – Aarohi – student play role of organizers.**

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

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

Sports and games are essentials components of human resource development, holding to promote good health, comradeship and spirit of healthy competition, which in turn, has positive and deep impact on the holistic development of the personality of the youth who is a potential source of energy, enthusiasm and inspiration for   development, progress and prosperity of the nation. Coaching   facilities are provided to the selected students (selected by conducting the selection trials of various games). Specialized coaches   are appointed to train the students going to participate in various West Zone, All India and Inter-Nit Tournaments. Well qualified sports instructors are   regularly instruct the students.

Games and Sports Facilities:-
Sports facilities currently available on the Campus
- One Cricket Ground with six Turf wickets.
- One Football Ground with flood light arrangement.
- Two Volleyball Courts with flood light
- One Badminton Court.
- A Table Tennis Hall
- Three Lawn Tennis Courts.
- One Flood light Basketball Court.
- Well equipped Gymnasium
- Cricket pavilion with the seating capacity of 500 students

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

8.1. Campus Infrastructure and Facility (10)
8.1.A Campus

New 1000 Seat Boys Hostel

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

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

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

The Institute has its own well equipped Health Centre 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., and 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 capacities 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 its own wells. To ensure regular and uninterrupted supply to all users a network of 9 underground sumps (reservoirs) are created having total storage capacity of 12-85 lakh litres of Potable Drinking Water. The average daily consumption is 6.50 lakh litres; mains water supply is limited to daytime hours from 7.45 am to 11.00 a.m. to individual Buildings overhead tanks.

8.1.4 C Campus Security Section:

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

8.2. Organisation, Governance, and Transparency (10)

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

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

(A) **Board of Governors**

Sr. No	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**

Sr. No.l	Name	Designation
1.	Dr. N. S. Chaudhari, Director, VNIT, Nagpur	Chairman
2.	Prof. S. V. Bhat, Deptt. of Physics, IIS, Bangalore – 560 012	Member
3.	Dr. T. S. Sampath Kumar, Asso. Prof., Deptt. of M.M.S.	Member
4.	Prof. (Ms.) R. B. Nair, HD,. H & S.S.,IIT, Delhi	Member
5.	Dr. Rajesh Gupta, Dean (Planning & Development), VNIT, Nagpur	Member
6.	Dr. R. K. Ingle, Dean (Faculty Welfare), VNIT, Nagpur	Member
7.	Dr. Animesh Chatterjee, Dean (Research & Consultancy), VNIT, Nagpur	Member
8.	Dr. R. M. Patrikar, Dean (Academics), VNIT, Nagpur	Member
9.	Dr. A. P. Patil, Dean (Students Welfare), VNIT, Nagpur	Member
10.	Dr. S. V. Bakre, Head, Deptt. of Applied Mechanics, VNIT, Nagpur	Member
11.	Prof. L. M. Gupta, Professor of Structural Engineering, VNIT, Nagpur	Member
12.	Prof. O. R. Jaiswal, Professor of Structural Engineering, VNIT, Nagpur	Member
13.	Dr. M. M. Mahajan, Professor of Structural Engineering, VNIT, Nagpur	Member
14.	Dr. G. N. Ronghe, Professor of Structural Engineering, VNIT, Nagpur	Member

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

Sr. No	Name	Designation
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**

Sr.No	Name	Designation
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, NAGPUR – 440001	Member
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.

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 M.E.   -- Member-
                                                      Secretary

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

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

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

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

In Rupees

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

8.3.1. Adequacy of budget allocation (4)

> (Instruction: Here the institution needs to justify that the budget allocated
> over the years was adequate.)
> The Institute receives grant-in-aid from the Government of India based on
> the budget formulated by it. There is enough 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	45,00,000	5,56,534		29,75,864		
Software				9,00,000		
R&D						
Laboratory consumables				26,868		
Maintenance and spares						
Training & travel						
Miscellaneous expenses for academic activities	10,50,000	1,73,534		6,00,736		
Non plan		30,164		1,35,317		
Total	**55,50,000**	**7,60,232**	**30,00000**	**46,38,785**		

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

8.4.1. Adequacy of budget allocation (5)

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

8.4.2. Utilisation of allocated funds (5)

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

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

8.5. Library (20)

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

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

Carpet area of library (in m2) Reading space (in m2) = 6400 m^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

LAYOUT OF VIRTUAL CLASSROOM VNIT
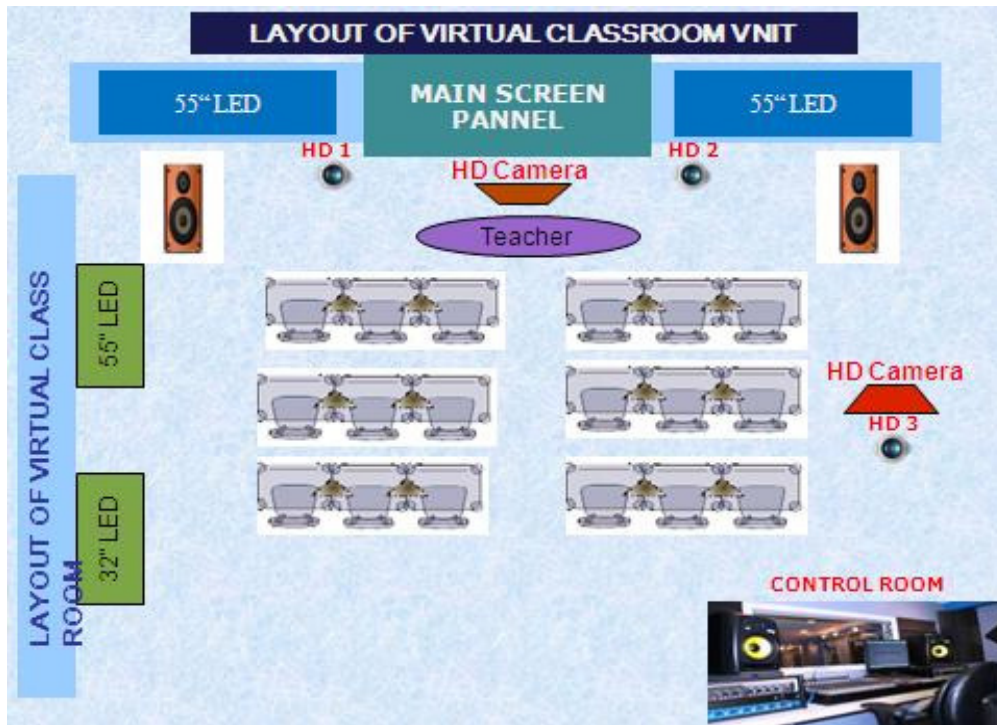
8.6.

Internet (5)

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

8.6.1   Network Center Information;-

Network Center provides a variety of Services. Network Center administers and manages the entire Campus Computer Network which includes departments, sections computer center, administrative building, library, Guest house, health center, NCC 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. Power lingo 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)
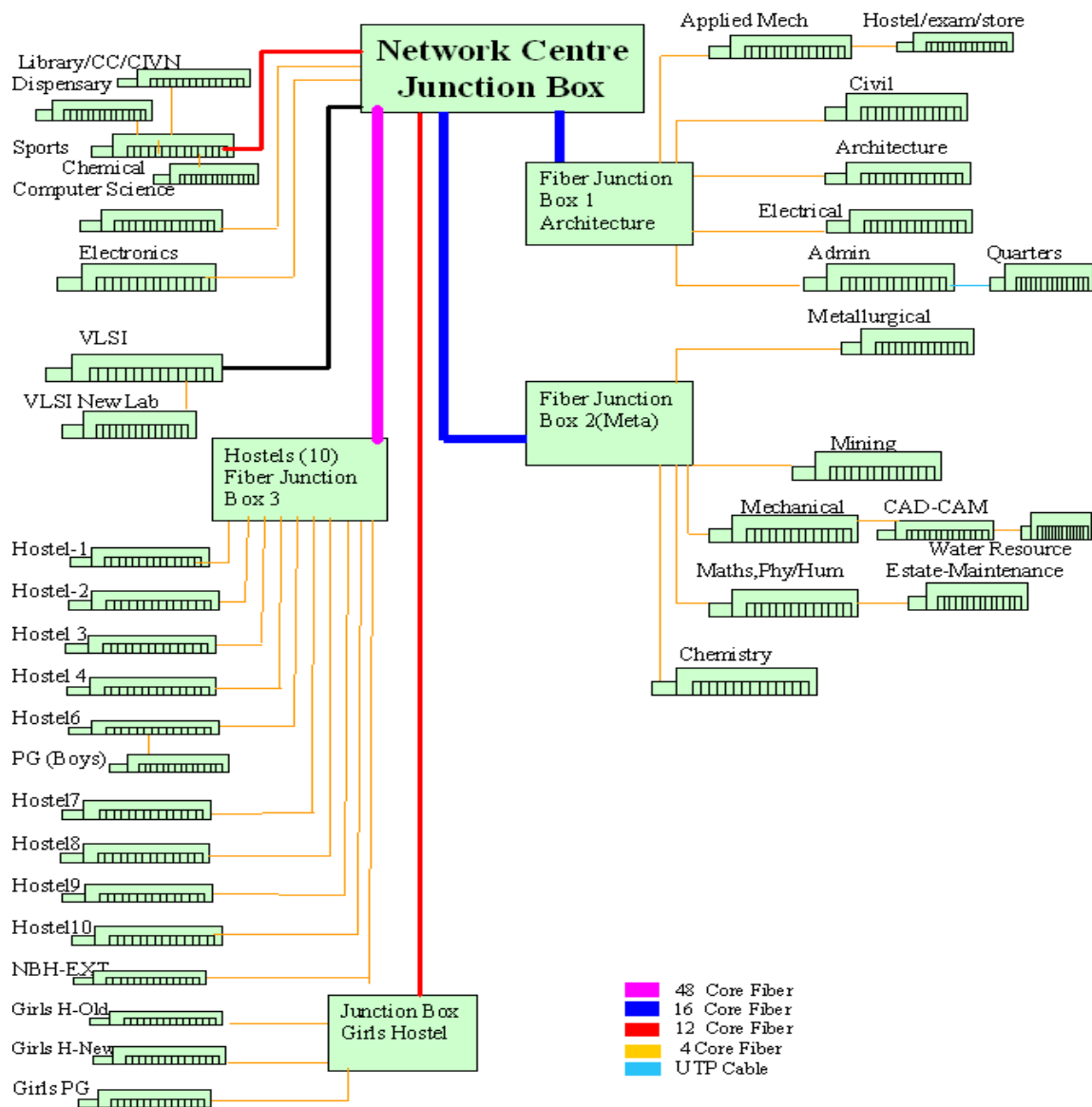
The annual charges of Reliance LL is approximately twenty five lakhs (Rs. 25,00,000) and that of BSNL LL is around ten lakhs (Rs. 10,00,000/-)

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

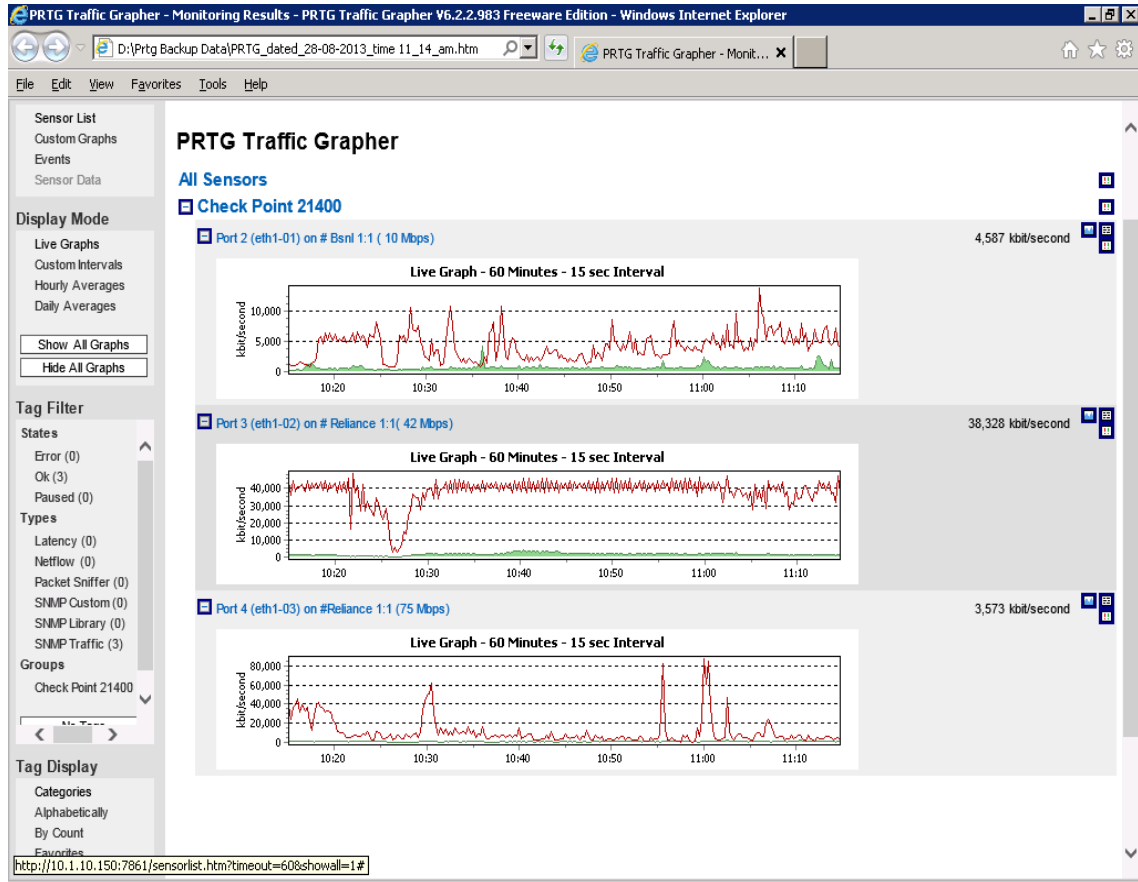|		
AMC	--	2.0 L
Reliance LL	--	25.0 L
BSNL	--	10.0 L

8.6.2 Physical Layout of Fiber Optic Cable of VNIT

   Figure I

Physical Layout of Fiber Optic Cable of VNIT

8.6.3   PRTG Traffic Grapher
Figure II

8.7. Safety Norms and Checks (5)

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

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

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

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

Fire Fighting Measures:

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

8.7.3. Safety of civil structure (1)

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

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

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

Date : 10/07/2013   sd/-
ENGINEER
ESTATE MAINTENANCE SECTION
V.N.I.T. NAGPUR

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

8.8. **Counselling and Emergency Medical Care and First aid (5)**
Availability of counselling facility (1)
Arrangement for emergency medical care (2) Availability of first-aid unit (2)
(Instruction: The institution needs to report the availability of the facilities discussed here.)

8.8.1 **Medical Care:**

<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.

8.8.2 **Physical Education facilities:**
Sports and Games are essentials components of Human Resource Development, helping to promote good health, comradeship and spirit of healthy competition, which in turn, has positive and deep impact on the holistic development of the personality of the youth who is a potential source of energy, enthusiasm and inspiration for development, progress and   prosperity of the nation. The Institute aims at all round development of the students. This can be seen from the importance given to the Physical Education. Classes for Physical Education have been included in regular Time Table so as to ensure development of Physical Fitness of the students. Physical Education programs   also include general health and safety information in addition to providing opportunities for students to learn how to cooperate with one another in a team setting.

Participation of students in different games

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

Krik Mania:

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

Intramural and Krida Diwas:

This is a unique program of event inter-section tournaments for different games conducted for first year B.Tech./B.Arch. students which goes round the year. The department celebrates the birth anniversary of the great Hockey legend Major Dhyanchand on 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

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

9.1. Improvement in Success Index of Students (5)

From 4. 1

Items	LYG	LYGm1	LYGm2	Assessment
Success Index	0.73	0.87	0.88	**4**

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

From 4. 2

Items	LYG	LYGm1	LYGm2	Assessment
API	6.95	7.33	7.11	**7**

9.3. Improvement in Student - Teacher Ratio (5)

From 5. 1

Items	CAY	CAYm1	CAYm2	Assessment
STR	**17.8**	**21.5**	**19**	**19**

9.4. Enhancement of Faculty Qualification Index (5)

From 5. 3

Items	LYG	LYGm1	LYGm2	Assessment
FQI	**5.4**	**5.2**	**6.1**	**6**

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

From 5.7and 5.9

Items	LYG	LYGm1	LYGm2	Assessment
FRC	2.4	2.4	2.2	**2**
FPPC	1.8	1.8	1.6	**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	

Assessment =

9.7. New Facility Created (15)

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

- 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	

- 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 Switch/Socket Board	 15 30
11	Miscellaneous- 1. Notice Boards 2. Curtain/Carpet Etc.	

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

Specify the overall improvement:

Specify the strength / weakness	Improvement brought in	Contributed by	List of PO(s), which are strengthened	Comments, if any
CAY 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	S. R. Sathe, P. S. Deshpande, U. A. Deshpande, M. P. Kurhekar, D. D.		

Research Publications, Consultancy Work, Sponsored Research Projects		Shrimankar, S. A. Raut		
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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-committee will have the right to decide on the basis of the submitted SAR whether the institution should be considered for an accreditation visit.

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

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

I undertake that, the institution is well aware about the provisions in the NBA's accreditation manual concerned for this application, rules, regulations and notifications in force as on date and the institute shall fully abide to them.

Signature, Name, and Designation of
the Head of the Institution with seal

Place:
Date: