NATIONAL BOARD OF ACCREDITATION

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

B. Tech. in Mechanical Engineering

Visvesvaraya National Institute of Technology Nagpur

NATIONAL BOARD OF **ACCREDITATION**

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(January, 2013)

Contents

Self Assessment Report (SAR) UG

Part A

I. Institutional Information

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

VISVESVARAYA NATIONAL INSTITUTE OF TECHNOLOGY(VNIT),

SOUTH AMBAZARI ROAD, NAGPUR 440010

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

Dr. Narendra S. Chaudhari, Director VNIT.

Ph : 0712 – 2801363

Email : director@vnit.ac.in

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

Ph : 0712-2801345

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

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.

1.3.2Location

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 mostpopulous city and 13th largest urban agglomeration in India. It is the 154th largestagglomeration 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 inIndia 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. Its 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*.

1.3.3Regular 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	

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

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:

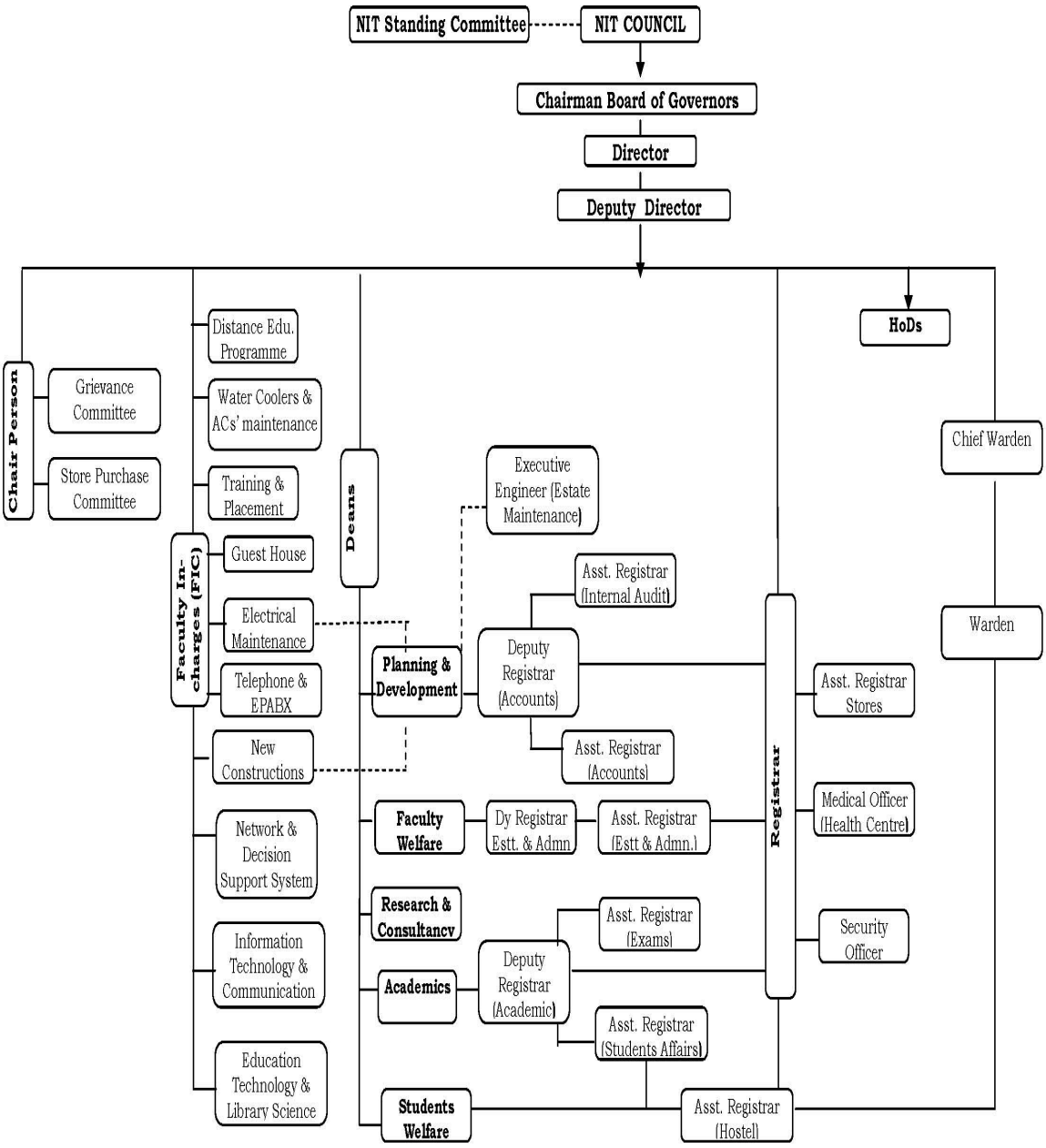
1.6.1 Administration

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

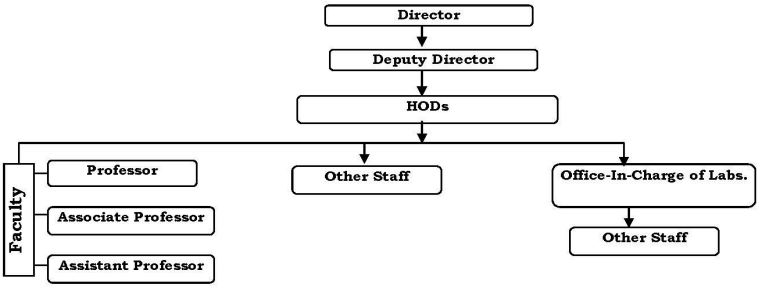
Figure - 1



1.6.3Flow Chart showing the hierarchy of Academic Departments

Figure - 2

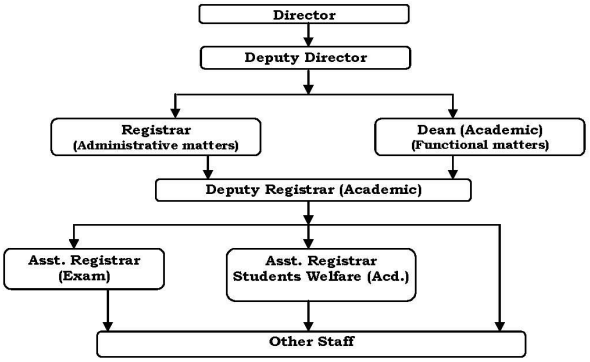
1. ACADEMIC DEPARTMENTS



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

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

2. ACADEMIC SECTION



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

* In consultation with Dean (Academic)

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

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

CFI (Centrally funded institution)

I.8. Nature of the trust/society:

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

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

Name of the Institution	Year of establishment	Location
NA	-	-

1.9. External sources of funds:

(Rs. in Lacs)

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

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

* No funds under plan were received.

I.10 Internally acquired funds:

(In Rupees)

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

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

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

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

[1] Indian Oil Corporation Scholarship, Indian Oil Corporation has announced 2600 Scholarships for students of 10+/ITI, MBBS, Engineering & MBA on merit basis.

[2] NTPC Scholarship, NTPC is offering 35 scholarships to students belonging to SC/ST/PC categories persons who are pursuing 4 years full time degree course in engineering on a competitive basis for applicant from NIT.

[3] ONGC Engineering Scholarships ONGC offers 75 Scholarships for SC/ST students who are pursuing higher education in Engineering, Geology, Geophysics and MBA.

[4] GATE stipend for qualified post graduate students.

[5] AICTE PG Scholarship 2013 for M.E./M.Tech/M.Pharma Students AICTE PG Scholarship 2013 for M.E./M.Tech/M.Pharma second year students.

[6] AICTE Scholarships for GATE Qualified Candidates 2013 For GATE Qualified Candidates 2013 for M.E./M.Tech/ second year students.

[7] Cargill Global Scholarships Program for Undergraduate Students 2013 Cargill Global Scholarships Program for Undergraduate Students 2013 is the global scholarship program for India, Brazil, Russia, China and the USA countries.

[8] North South Foundation Scholarships 2014 (NSF) Scholarships 2014 for those doing BE/BTech.

[9] NATIONWIDE EDUCATION AND SCHOLARSHIP TEST (N.E.S.T.) 2013 Natinalwide education and scholarship test (n.e.s.t.) 2013 For Degree Students Of Science Engg. Courses.

[10] Scholarship for Physically Handicapped Students National Handicapped Finance and Development Corporation (NHFDC).

[11] MOMA scholarship – Annually government of India offers 20000 scholarships that distributed among the students of minority communities throughout the country, to eligible students from this institute.

[12] State Government Scholarships from Social Welfare Department for eligible students from this institute.

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

indicated below :

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

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

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

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

I.13 Total number of engineering students:

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

Total number of other students, if any

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

I.14 Total number of employees:

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

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

A. Regular Staff

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

B. Contract Staff

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

End of Part A I Institutional Information

II. Departmental Information

II.1. Name and address of the department:

Dr. S.B. Thombre

Head of the Department, Department of Mechanical Engineering, Visvesvaraya National Institute of Technology,South Ambazari Road, Nagpur – 440010.

Contact:07122801379/1275, E-mails:sbthombre@mec.vnit.ac.in,head@mec.vnit.ac.in, &sbthombre64@gmail.com

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

Dr. Arun K. Singh, Assistant Professor, E-mail: aksingh@mec.vnit.ac.in, aksinghb@gmail.com, Contact: 09730655666/09323528623, (Mob), 01722801273(Office), 01722801289(Home)

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:

Department of Mechanical Engineering is one of the three departments, the Institute started with in the year 1960. The Institute was then called as Visvesvaraya Regional College of Engineering (VRCE) and was affiliated to the Nagpur University till 2002. The degrees awarded were Bachelor of Engineering (B.E.) and Master of Engineering (M.E.) for UG and PG programmes respectively. After upgradation to National Institute of Technology in the year 2002, the UG and PG degrees awarded are B.Tech. and M.Tech. respectively. The mechanical department has, on date, one UG program, three PG programs and also doctoral research program.

Program	**Description**
UG (B.Tech) in 1) Mechanical Engineering	Started with 15 seats in 1960 Intake increases to 60 in 1975 Intake increases to 92 in 2010
PG (M Tech) in 1) Industrial Engineering 2) Heat Power Engineering 3) CAD/CAM Engineering	Started with 13+5(sponsored) seats Industrial Engineering in 1989 Heat Power Engineering in 2002 CAD/CAM Engineering in 2007 and intake in all branches is increased to 20 seats in 2010 in each

II.4. Mission and Vision of the Department

Vision of the Department of Mechanical Engineering

To produce quality human resource of high standard in mechanical engineering who can contribute favourably to the technological and socio-economic development of the nation.

Mission of the Department of Mechanical Engineering

i. To develop state of the art facilities related to mechanical engineering.

ii. To attracthighly qualified faculty to the mechanical engineering department.

iii. To promote participation of industries in academic, research and consultancy.

iv. To undertake research at regional and national level.

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

- Mining Department offers a course on "Mechanical Engineering".
- First year students from all the Departments are taught "Engineering Drawing".
- Electrical Engineering Department was offering a course on"Industrial Management" in the year 2010-11 and earlier.

II.6. Total number of students:

UG: 276

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	**2012-13**		**2011-12**		**2010-11**	
	Min	**Max**	**Min**	**Max**	**Min**	**Max**
Teaching faculty with Department	22	22	21	21	23	23
	+5 are deputed+ 1 is Ad-hoc	+5 are deputed+1 is Ad-hoc	1 is deputed + 3 are ad-hoc	1 is deputed + 3 are ad-hoc	1 is deputed + 1 is ad-hoc	1 is deputed + 1 is ad-hoc
Non teaching Staff	7 Department+11 Workshop	7 Department +11 Workshop	7 in Department+11 in Workshop	7 in Department+11 in Workshop	7 in Deptt.+11 in Workshop	7 in Department +11 in Workshop
Total	40	40	39	39	41	41
*Faculty on deputation and ad-hoc faculty are not included in the total.						

*Minimum and maximum number of staff on roll during the current academic year (2013-

14) are 38 (Teaching faculty: 21 and Non-Teaching: 17).

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 2012-13(Lakhs)**	***Actual expenses in 2012-13(Lakhs) Planned grant and Non-planned grant**		**Budgeted in 2011-12 (Lakhs)**	***Actual Expenses in 2011-12 (Lakhs) Planned grant and Non-planned grant**		***Budgeted in 2010-11 (Lakhs)**	***Actual Expenses in 2010-11 (Lakhs) Planned grant and Non-planned grant**	
		PG**	**NPG***		**PG**	**NPG**		**PG**	**NPG**
Laboratory Equipments		15.56547	-		0.61286	-		25.79122	-
Software purchase		4.000			7.76584			-	
Laboratory consumables		6.15730			3.95568			-	
Maintenance and spares		5.86699			-			0.35847	
Travel		-						-	
Miscellaneous expenses for academic activities		-	1.89127			0.75742+3.29652+1.27632			1.23640+0.76116
		31.58976	1.89127		12.33438	5.33026		26.14969	2.04756
Total	**53.5**	**33.48076**		**53.0**	**17.66464**		**27.0**	**28.19725**	

*The Budget for the current financial year (2013-14), all items taken together is PG : 50 Lakhs & NPG : 3.5 Lakhs. The actual expenditure as on date is 50Lakhs+.

PG** = Plan grant, NPG*** = Non plan grant.

*There are many items of expenditure which are met from institute budget such as AMC, Computer Consumable etc., which are not accorded above.

III. Programme Specific information:

III.1. Name of the Programme: Bachelor of Technology (B.Tech.)

(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 in Mechanical Engineering

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

Programme coordinator for the NBA:

Dr. S.B. Thombre

Head of the Department, Department of Mechanical Engineering, Visvesvaraya National Institute of Technology,South Ambazari Road, Nagpur - 440010
Contact:07122801379/1275,E-mails:sbthombre@mec.vnit.ac.in,head@mec.vnit.ac.in, and sbthombre64@gmail.com

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

Dr. Arun K. Singh, Assistant Professor, E-mails: aksingh@mec.vnit.ac.in, aksinghb@gmail.com, Contact: 09730655666/09323528623, (Mob), 01722801273(Office), 01722801289(Home)

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

Program	**Description**
UG in Mechanical Engineering	Started with 15 seats in 1960 Intake increases to 60 in 1975 Intake increases to 92 in 2010

The programme was accredited twice in the past: in 2002- for five years and in 2009-for three years.

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

Nil

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

276

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	**2012-13**		**2011-12**		**2010-11**	
	Min	**Max**	**Min**	**Max**	**Min**	**Max**
Teaching faculty with Department	22	22	21	21	23	23
	+5 are deputed+ 1 is Ad-hoc	+5 are deputed+1 is Ad-hoc	1 is deputed + 3 are ad-hoc	1 is deputed + 3 are ad-hoc	1 is deputed + 1 is ad-hoc	1 is deputed + 1 is ad-hoc
Non teaching Staff	7 Department+11 Workshop	7 Department +11 Workshop	7 in Department+11 in Workshop	7 in Department+11 in Workshop	7 in Deptt.+11 in Workshop	7 in Department +11 in Workshop
Total	40	40	39	39	41	41
*Faculty on deputation and ad-hoc faculty are not included in the total.						

*Minimum and maximum number of staff on roll during the current academic year (2013-14) are 38 (Teaching faculty: 21 and Non-Teaching: 17).

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 2012-13(Lakhs)**	***Actual expenses in 2012-13(Lakhs) Planned grant and Non-planned grant**		**Budgeted in 2011-12 (Lakhs)**	***Actual Expenses in 2011-12 (Lakhs) Planned grant and Non-planned grant**		***Budgeted in 2010-11 (Lakhs)**	***Actual Expenses in 2010-11 (Lakhs) Planned grant and Non-planned grant**	
		PG**	**NPG*****		**PG**	**NPG**		**PG**	**NPG**
Laboratory Equipments		15.56547	-		0.61286	-		25.79122	-
Software purchase		4.000			7.76584			-	
Laboratory consumables		6.15730			3.95568			-	
Maintenance and spares		5.86699			-			0.35847	
Travel		-						-	
Miscellaneous expenses for academic activities		-	1.89127			0.75742 +3.29652+1.27632			1.23640+ 0.76116
		31.58976	1.89127		12.33438	5.33026		26.14969	2.04756
Total	**53.5**	**33.48076**		**53.0**	**17.66464**		**27.0**	**28.19725**	

*The Budget for the current financial year (2013-14), all items taken together is PG : 50 Lakhs& NPG : 3.5 Lakhs. The actual expenditure as on date is 50Lakhs.

PG** = Plan grant, NPG*** = Non plan grant.

PART B

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

1.1. Vision and Mission(5)

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

Vision and Mission of the institute:

Vision

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

Mission

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

Vision of the Department

- To produce quality human resource of high standard in mechanical engineering who can contribute favourably to the technological and socio-economic development of the nation.

Mission of the Department of Mechanical Engineering

i. To develop state of the art facilities related to mechanical engineering.
ii. To attract highly qualified faculty to the mechanical engineering department.
iii. To promote participation of industries in academics research and consultancy.
iv. To undertake research at regional and national level.

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

- Institute/Department website, curricula book and at the main entrance of the Department building and workshop building.

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

- The Vision and Mission of the department are derived from the Institute's Vision and Mission and discussed in the Departmental faculty meeting.

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)

PEOs of the B.Tech program are as following:

(I) To impart to the students knowledge of contemporary science and mechanical engineering related subjects.
(II) To enhance analytical skills of the students for decision making.
(III) To provide opportunity to the students to expand their horizon beyond mechanical engineering.
(IV) To prepare the students to take-up career in different industries or to pursue higher studies in mechanical and interdisciplinary programs.
(V) To create awareness amongst the students towards social, environmental and energy related issues.
(VI) To introduce the students to the professionalism and effective communication skills.

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

- Institute/Department website and curricula book

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

Major stakeholders of this programme are:

1. Society: Admitted students, Parents of the students and local communities, Human society
2. Academia: All teaching, non-teaching and administrative staff bodies of VNIT Nagpur, Board of Governors (BoG)
3. Governments: Government of India, Government of Maharashtra, Government of other states.
4. Industry

1.2.4. State the process for establishing the PEOs (5) :
(Describe the process that periodically documents and demonstrates that the PEOs are based on the needs of the programme's various stakeholders.)

1. Departmental meeting
2. Feedback from peer review
3. Feedback from industries
4. Feedback from students/ alumni
5. Feedback from training and placement department

1.2.5. Establish consistency of the PEOs with the Mission of the Institute (5)
(Describe how the Programme Educational Objectives are consistent with the Mission of the department.)

PEOs	Institute Mission Satisfied
I	√
II	√
III	√
IV	√
V	√
VI	√

1.3. Achievement of Programme Educational Objectives (PEOs) (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.)

Sr No.	academic factors involved	Attainment of PEOs
1	Class room teaching, laboratory works. DC/ DE / OC Courses	I, II, III, IV
2	Minor and Major projects	II, V, VI
3	Industrial visits, experts lectures	IV, V
4	Cultural and Technical Festivals	V, VI

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. Senate has framed rules and regulations for governing the undergraduate program at VNIT Nagpur. Accordingly, Board of Studies (BoS) in Mechanical Engineering has proposed courses under different categories such as core, elective, open, humanities etc. All the statuary bodies are formed as per the norms specified like Senate, BoS etc.
2. Financial support by the Institute for recurring and non-recurring type of expenditure through Dean P&F.
3. Research and consultancies are routed through dean R&C of the Institute
4. Students admission and examination related activities including results are supported by Dean academic.

5. Welfare of the students are looked after by dean student welfare/ Professor –in -charge of the Training and Placement section.
6. Welfare of the faculty is looked after by Dean faculty welfare.
7. Besides all these, there are central facilities like library, civil maintenance, electrical maintenance, heath center, computer center, Play grounds etc which help in attainment of the PEOs.

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

1.4.1. Indicate tools and processes used in assessment of the achievement of the PEOs (25)
Describe the assessment process that periodically documents and demonstrates the degree to which the Programme Educational Objectives are attained. (10)
Include information on: (15)

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

PEOs	Tools and Processes used	Evidence	Frequency
I	Class room teaching/lab work	Data gathered through examination results. Class test, Two mid-semester test and End-semester test, assignments, quizzes	Once in semester as per schedule
II	Projects, seminar, modern tools and softwares	Though examination by the board constituted under the academic rules and regulations	Once in four year
III	Open elective course, Industrial visits and multi disciplinary projects	Registration of the students for other department subject	Every semester
IV, VI	Project, competitive exams, higher studies, industrial visit and extra-mural lectures, soft skill training	Through respective examination results, and other information on specific activities as maintained by the department. Also training and placement records	Yearly
V	Cultural and technical festivals, relevant elective courses	Participation in cultural and technical festivals. Information from dean student counselling	Once in semester

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

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

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

c) How the results are documented and maintained.

PEOs	**Expected level of achievements**	**Evidences of achievements**	**Achievement of PEOs**	**Document maintained by**
I	100%	More than 90% of the students have passed the B.Tech program and also have completed the credit requirements for the program	90%	Examination section
II	90%	Project results indicate that most of the students have acquired the minimum analytical skills required for decision making	(Percentageof students scoring grade more than AB i.e., 9/10)	Examination section
III	100%	It is estimated that 10% of the students are going for higher studies in multi-disciplinary programs	Data not available	Alumni office
IV	100%	More than 90% of the students are placed with different industries or have gone for higher studies.	90%	Placement office
V	100%	Students are involved in culture and technical festivals also in involved in activities for social concern for instance PRAYAS, 'Joy of Giving' etc.	50%	Office of dean of student welfare and gymkhana
VI	80%	Consistent good placement record		Training and placement

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)

The present PEOs are framed for the first time and however these PEOs will be refined in due course of time based on feedback from students, alumni, mentors, peer reviews, industries and society at large.

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)
Course objectives for individual course are given in the syllabus attached in the annexure. **However these can broadly classified as following:**

Sr. No.	Type of courses	Course Outcomes (COs)*
1	Core courses	After acquiring requisite credits from the core courses, students will be equipped with the basic and fundamental knowledge of mechanical engineering and will be able to apply it to real life problems.
2	Elective courses	Depending on their interests, students will be able to acquire detailed knowledge in the selected areas of mechanical engineering.
3	Open courses	Students will be able to diversify their knowledge domain in different engineering disciplines
4	Projects	Students will be able to apply knowledge gained through the above courses to real life problems on a specific topic. Also students will be able to exhibit their soft skills and ability to work in team.

*They are framed for the first time, thus these will be refined in due course of time.

POs of the B.Tech in mechanical engineering are as follows:

Sr. No.	Programme Outcomes (POs)*
a)	The graduates will be able to apply knowledge of basic sciences (maths, physics, chemistry etc.) and engineering (core and elective subjects) in getting solutions to mechanical engineering related problems.
b)	The graduates will be able to design and conduct experiments as well as analyze and interpret data.
c)	The graduates will be able to design a system or a component of a system for a specific task within realistic constraints
d)	The graduates will be able to undertake multi disciplinary courses and tasks.
e)	The graduates will be able to formulate and apply the knowledge of mathematical techniques in solving the governing equations of a system under consideration.
f)	The graduates will be able to develop industrial and professional ethics and managerial skills.
g)	The graduates will be able to communicate effectively their point of views
h)	The graduates will be able to study the impact of mechanical systems on the global, economic, environmental and societal context.
i)	The graduates will acquire attitude for life- long learning
j)	The graduate will be able to use modern tools, softwares, equipments etc. to analyze and obtain solution to the problems.
k)	The graduates will be able to participate in competitive examinations for success.

*They are framed for the first time, thus these will be refined in due course of time.

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)

Departmental brochure, Institute Website, Entrance to the Department and workshops

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.)

POs are based on the graduate attributes described by the NBA. They are also discussed in the departmental meetings.

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.)
Graduate Attributes are

Sl. No.	**Graduate Attributes as defined by NBA**	**Aligned Program outcome (POs)**
1.	An ability to apply knowledge of science and engineering	a
2.	The graduates will be able to design and conduct experiments as well as analyze and interpret data.	b
3.	The graduates will be able to design a system or a component of a system for a specific task within realistic constraints.	c
4.	The graduates will be able to undertake multi disciplinary courses and tasks.	d
5.	The graduates will be able to formulate and apply the knowledge of mathematical techniques in solving the governing equations of a system under consideration.	e
6.	The graduates will be able to develop industrial and professional ethics and managerial skills.	f
7.	The graduates will be able to communicate effectively their point of views.	g
28.	The graduates will be able to study the impact of mechanical systems on the global, economic, environmental and societal context.	h
9.	The graduates will acquire attitude for life- long learning.	i
10.	The graduate will be able to use modern tools, softwares, equipments etc. to analyze and obtain solution to the problems.	j
11.	The graduates will be able to participate in competitive examinations for success.	k

2.1.5. Establish the correlation between the POs and the PEOs (10)
PEOs of the B.Tech program are as following:
(Explain how the defined POs of the program correlate with the PEOs)

PEOs\POs	a	b	c	d	e	F	g	h	i	j	k
i.	√	√	√	√	√	√	√	√	√	√	√
ii.	√	√	√	√	√	X	√	x	x	x	x
iii.	√	√	√	√	√	√	√	√	√	√	√
iv.	√	√	√	√	√	√	√	√	√	√	√
v.	√	x	√	√	√	√	x	√	√	x	√
vi.	√	√	x	√	x	√	√	√	√	√	√

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)

Following table describes how course outcomes (Cos) contribute to the POs.

COs/POs	a	b	c	d	e	f	g	h	i	j	k
1	H	H	H	x	H	x	A	x	x	x	H
2	H	A	H	A	H	L	A	A	H	A	H
3	A	x	L	H	x	L	A	A	A	L	H
4	H	H	H	A	H	H	H	H	A	H	L

Notations: H: High strength, A: Average strength, L: Low strength, x: Not applicable

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.)

Different delivery methods						
POs/ Modes	**Black/ Whiteboard teaching**	**Experiments**	**Power Point slides**	**Guest lecture**	**visit**	**Presentation /seminar**
A	H	H	L	x	x	x
B	H	H	x	x	A	x
C	H	x	L	x	x	A
D	A	L	A	A	x	L
E	H	L	L	L	x	x
F	L	L	H	H	A	H
G	L	H	H	H	x	H
H	A	L	L	A	L	A
I	L	L	L	H	A	x
J	L	A	H	H	A	H
K	L	L	x	L	x	L

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

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

Assessments/POs	a	b	c	d	e	f	g	h	i	j	k
Assessment of teacher	√	x	√	√	√	√	√	√	√	√	√
Examination	√	√	√	√	√	√	√	√	√	√	√
Experiments	√	√	√	√	√	x	x	x	x	√	√
Projects	√	√	√	√	√	x	x	√	x	√	√
Seminar	x	√	√	√	√	√	√	√	√	√	√

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.)

Semester	**Contact hours**		**Credits**	**Ratio of theory credit and practical credit**	**Ratio of contact hours for theory and practical**
	L+T	P			
I	17	4	38	8.5	4.25
II	16	8	40	4.0	2.00
III	17	2	36	17.0	8.50
IV	16	8	40	4.0	2.00
V	19	6	44	6.34	3.17
VI	18	8	44	4.50	2.25
VII	15	2	34	7.50	3.75
VIII	15	2	32	15	7.50
Project	-	-	12	--	--
Total	133	42	320	6.33	3.16

Above table reflects that for every practical credit, we have 6.04 credits of theory which is equivalent to 86% theory and 14% practical. On the contact hour basis, this is 75% theory and 25% practical.

Project work is completed in two phases namely Phase I (4 credits) and Phase II (8 credits). The project work assigned to the student is related to academic curriculum and based on the current topics of interest. Evaluation is carried out as given in section 2.3. Attainment of POs for theory as well as practical & project work can be seen in section 2.3.

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, industrialadvisory committee;

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

c) Summaries of the results of the evaluation processes and an analysis illustrating the extent to which each of the programme outcomes are attained; and it is expected that the extent to which each of the program outcomes are attained are given in the above table. The average score is considered to be the level of attainment of the Pos. .

d) How the results are documented and maintained.

A teacher compiles the data of mid-term (I&II) and end semester and assessment if any in his or her subject. He or she decides the grade points cut off and hence awards the grade to the student. The teacher then enters the marks and the grades in the exam software. Four hard copies are signed, two for examination section one for department and one for self. This record is maintained by examination section

The following table describes the degree to which POs are attained. It also indicates the frequency of assessment process.

Extent to which PO are attained					
Assessments/POs		**Frequency / sem**	**Theory courses**	**Practical courses**	**Project courses**
Written Examination	Sessional- I	1	15%	--	--
	Sessional- II	1	15%	--	--
	End Semester	1	60%	--	--
	Teacher's assessment	1	10%	--	--
Practical examination (Experiments, Practical records and Voiva-voce	Ist mid-sem	1	--	30%	--
	IInd mid-semester	1	--	30%	--
	Performance& Viva-voce	1	--	40%	--
Project examination	Ist mid-sem	1	--	--	20%
	IInd mid-sem	1	--	--	30%
	End sem	1	--	--	50%

1. Grades are decided based on the cumulative score of above examinations.
2. Students are shown their valued answer book and solutions are discussed in the class.
3. A project is offered to a group of students during final year. The project is to be completed in two phases i.e., Phase-I and Phase-II. Project Phase –II is evaluated by an external examiner.
4. Evaluation of class test records is maintained by respective class instructor.
5. The final consolidated records are maintained by Examination section.

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

c) The expected level of attainment for each of the program outcomes (POs):

The expected level of attainment for each of the program outcomes POs of the B.Tech in mechanical engineering are as follows:

Theory Courses: *EL : Expected level, *AL : Achieved level

S. No.	Course name	Course code	a	b	c	d	E	f	g	h	i	j	k	EL*	AL*
1.	Engineering Drawing	MEC101	√	√	√	√					√	√		0.8	0.82
2.	Integral Transform & PDE	MAL 201	√	√	√	√						√	√	0.8	0.87
3.	Theory of Machine – 1	MEL 201	√	√	√		√			√		√	√	0.8	0.7
4.	Fluid Mechanics	MEL 202	√	√		√				√			√	0.8	0.7
5.	Engg. Thermodynamics	MEL 203	√	√	√	√	√	√	√	√	√	√	√	0.8	0.7
6.	Engg. Metallurgy	MEL 204			√	√	√				√		√	0.8	0.64
7.	Solid Mechanics	MEL 206	√								√		√	0.8	0.61
8.	Manufacturing Process – I	MEL 207	√	√	√	√	√	√				√	√	0.8	0.67
9.	Theory of Machine – II	MEL 301	√	√	√		√	√			√	√	√	0.8	0.7
10.	Heat Transfer	MEL 302	√	√	√	√	√			√	√	√	√	0.8	0.7
11.	Energy Conversion – I	MEL 303	√	√	√	√	√		√	√	√		√	0.8	0.7
12.	Machine Design – I	MEL 304	√	√	√		√	√	√	√	√	√	√	0.8	0.7
13.	Manufacturing Process - II	MEL 305	√	√	√						√	√	√	0.8	0.74
14.	Machine Drawing	MEL 306	√		√		√	√				√		0.8	0.65
15.	Fluid Machines	MEL 307	√	√	√	√	√			√	√	√	√	0.8	0.66
16.	Energy Conversion – II	MEL 308	√	√	√	√			√	√	√	√	√	0.8	0.69
17.	Machine Design – II	MEL 309	√	√	√							√	√	0.8	0.8
18.	Manu. Process & Automation	MEL 310	√	√	√							√	√	0.8	0.67
19.	Metrology & Quality Assurance	MEL 311	√	√	√								√	0.8	0.68
20.	Control System	MEL401	√	√	√	√					√			0.8	0.76
21.	Operation Research	MEL403		√			√							0.8	0.73
22.	Optimization	MEL405	√	√	√	√	√			√	√	√	√	0.8	0.77

23.	Industrial Engg. & Mgt.	MEL424	√	√	√	√	√	√	√	√	√	√		0.8	0.7
24.	Biomechanics	MEL 407	√			√			√			√	√	0.8	0.72
25.	Supply Chain Management	MEL408	√	√		√	√		√		√	√		0.8	0.79
26.	CAD	MEL 410	√	√	√	√	√		√		√	√	√	0.8	0.67
27.	Energy Management	MEL-411	√		√	√			√	√	√	√	√	0.8	0.73
28.	Air Conditioning	MEL412	√	√	√	√	√	√		√	√	√	√	0.8	0.75
29.	Fracture Mechanics	MEL413	√	√	√	√	√	√	√	√				0.8	0.8
30.	Tribology	MEL 414	√	√		√	√			√	√	√		0.8	0.7
31.	Mechanical Vibration	MEL 415	√	√	√	√	√	√	√				√	0.8	0.75
32.	Industrial Robotics	MEL 416	√	√	√	√					√	√		0.8	0.85
33.	Power Plant Engineering	MEL 417	√		√		√	√		√			√	0.8	0.64
34.	Advanced Stress Analysis	MEL 418	√	√	√							√	√	0.8	0.63
35.	Finite Element Method	MEL420	√		√	√						√	√	0.8	0.74
36.	Comp Methods in Engg	MEL 421	√	√	√		√			√	√				0.7
37.	Automobile Engineering	MEL422	√	√	√		√	√		√		√	√	0.8	0.77
38.	Meas. & Sig Processing	MEL 423	√	√	√	√	√				√	√		0.8	0.7
39.	Ind Engg & Mgt	MEL 424	√		√	√	√	√	√	√	√	√	√	0.8	0.7
40.	Reliability & Maintenance Engg.	MEL 425	√		√	√	√	√	√	√	√	√		0.8	0.69
41.	Refrigeration & Cryogenics	MEL426	√	√	√	√	√	√		√	√	√	√	0.8	0.76
42.	Machine Tool Design	MEL-428	√	√	√		√	√		√			√	0.8	0.7
43.	Renew. Energy Sources	MEL 429	√	√	√	√	√				√	√		0.8	0.7
44.	Adv. I. C. Engine	MEL 430	√	√	√	√			√	√	√	√	√	0.8	0.70
45.	Advanced Mechanisms	MEL 431	√	√	√							√	√	0.8	0.67
46.	Computer Graphics and Solid Modelling	MEL 432	√	√	√		√			√	√			0.8	0.79
47.	CFD	MEL435	√	√	√	√	√			√	√			0.8	0.8
48.	Composite Materials	MEL 437	√	√	√	√	√				√	√		0.8	0.7
49.	Product Design and Development	MEL 439	√	√	√	√	√	√	√	√	√	√		0.8	0.7
50.	Computers & Database Management	MEL 441	√	√	√	√	√	√				√		0.8	0.6
51.	Air Pollution Control	MEL 443	√	√	√	√			√	√	√	√	√	0.8	0.74
52.	Solar Energy Utilization	MEL444	√	√	√	√	√		√	√	√	√	√	0.8	0.7
53.	Automation in Production	MEL 445		√	√							√		0.8	0.64
54.	Artificial Intelligence in Manufacturing	MEL 446	√		√	√	√				√	√	√	0.8	0.7
55.	Engg. Economics	MEL 447	√	√	√	√	√			√	√			0.8	0.76

Practical Courses :*EL : Expected level, *AL : Achieved level

S. No.	Course name	Course code	a	b	c	d	e	F	g	h	i	j	k	EL*	AL*
1.	Engineering Drawing	MEP101	√	√	√	√					√	√		1	0.7
2.	Fluid Mechanics Lab	MEP 202	√			√	√		√	√	√		√	1	0.85
3.	Engg. Metallurgy Lab.	MEP 204			√	√	√				√		√	1	0.84
4.	Manufacturing Process – I Lab	MEP 207	√	√	√	√	√	√				√	√	1	0.73
5.	Theory of Machine – II Lab	MEP 301	√	√	√		√	√			√	√	√	1	0.92
6.	Thermal Lab.	MEP 302	√	√	√	√	√		√	√	√	√		1	0.83
7.	Design Lab	MEP 304	√	√	√	√	√	√			√	√	√	1	0.95
8.	Manufacturing Process – II Lab.	MEP 305	√	√	√			√			√	√	√	1	0.71
9.	Machine Drawing Lab.	MEP 306	√	√	√		√	√				√		1	0.81
10.	Fluid Machines Lab.	MEP 307	√	√	√	√	√			√	√	√	√	1	0.88
11.	Energy Conversion – II Lab.	MEP 308	√	√	√	√			√	√	√	√	√	1	0.87
12.	Machine Design-II Lab.	MEP 309	√	√	√							√		1	0.82
13.	Manu. Process & Automation	MEL 310	√	√	√							√	√	1	0.82
14.	Metrology & Quality Assurance Lab.	MEP 311		√	√							√	√	1	0.78
15.	CAD	MEP 410	√	√	√	√	√		√		√	√	√	1	0.85
16.	Finite Element Method Lab.	MEP420	√		√	√						√		1	0.92
17.	Automobile Engineering Lab.	MEP422	√	√	√		√	√		√		√	√	1	0.89
18.	Refrigeration & Cryogenics Lab	MEP 426	√	√	√	√	√	√		√	√	√	√	1	0.8
19.	Adv. I. C. Engine	MEP 430	√	√	√	√			√	√	√	√	√	1	0.85
20.	Computer Graphics and Solid Modelling	MEL 432	√	√	√		√			√	√			0.8	0.79
21.	Computers & Database Management (Lab)	MEP 441	√	√	√	√	√	√				√		1	0.84
22.	Automation in Production (Lab)	MEP 445		√	√							√		1	0.73
23.	Project Phase-I	MED401	√	√	√	√	√	√	√	√	√	√	√	1	0.79
24.	Project Phase-II	MED402	√	√	√	√	√	√	√	√	√	√	√	1	0.75

H: High strength, A: Average strength, L: Low strength

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)

At the end of the semester, feed backs are collected from the students and deficiencies (if any) as suggested by the students are conveyed to the concerned course coordinator/teacher. If found necessary, the course coordinator brings out the changes in the curriculum which are later put for approval through the BOS in the Senate.

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)

1. During course of the semester, the deliverable skills and pace of the course are discussed with the students in the class committee meeting.

2. Based on the discussions in the class committee meeting, the course coordinator/teacher makes appropriate changes in the teaching technique.

3. If required additional classes are also engaged by the respective course coordinator for benefit of academically weak students.

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.)

1. All the feedbacks from the students are collected by designated facultyand collated by a sub-committee of BoS.
2. These feedbacks are discussed first in the faculty meeting and later in BOS meeting.
3. The corrections are applied to the POs if necessary.
4. These corrections/modifications are placed before the Senate for approval.

Since POs and PEOs etc. are defined for the first time, this process has not been used in the past.

3.Programme Curriculum (125)

3.1. Curriculum (20)

3.1.1. Describe the Structure of the Curriculum (5)
B.Tech in Mechanical Engineering

Credit requirements :

Category	Credits
First year subjects	78
Departmental core (DC)	152
Departmental core (DE)	90
Total	320

Course Code	Course title	Total number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical# (P)	Total Hours	
1st B. Tech. :						
MEC101	Engineering Drawing	3	0	2	5	08
III Sem. B. Tech. (Mechanical Engg.) :						
MEL 201	Theory of Machine – 1	4	0	0	4	08
MEL 203	Engg. Thermodynamics	3	0	0	3	06
MEL 204	Engg. Metallurgy	3	0	0	3	06
MEL 206	Solid Mechanics	3	1	0	4	08
MEP 204	Engg. Metallurgy Lab.	0	0	2	2	02
MAL 201	Integral Transform & PDE	3	0	0	3	06
IV Sem. B. Tech. (Mechanical Engg.) :						
MEL 202	Fluid Mechanics	3	1	0	4	08
MEL 207	Manufacturing Process – I	3	0	0	0	06
MEP 207	Manufacturing Process – I Lab	0	0	2	2	02
MEL 301	Theory of Machine – II	3	0	0	3	06
MEP 301	Theory of Machine – II Lab	0	0	2	2	02
MEL 303	Energy Conversion – I	3	0	0	3	06
MEL 304	Machine Design – I	3	0	0	3	06
MEP 304	Design Lab	0	0	2	2	02
MEP 202	Fluid Mechanics Lab.	0	0	2	2	02
V Sem. B. Tech. (Mechanical Engg.) :						
MEL 302	Heat Transfer	3	0	0	3	06
MEL 305	Manufacturing Process - II	3	0	0	3	06
MEL 306	Machine Drawing	3	0	0	3	06
MEL 308	Energy Conversion – II	3	0	0	3	06
MEL 417	Power Plant Engineering	3	0	0	3	06
MEL 431	Advanced Mechanisms	3	0	0	3	06

	(CAD/CAM)					
MEL 414	Tribology	3	0	0	3	06
MEL 421	Comp. Methods in Engg.	3	0	0	3	06
MEL 416	Industrial Robotics	3	0	0	3	06
MEP 302	Thermal Lab.	0	0	2	2	02
MEP 305	Manufacturing Process – II Lab.	0	0	2	2	02
MEP 306	Machine Drawing Lab.	0	0	2	2	02
MEP 308	Energy Conversion – II Lab.	0	0	2	2	02
VI Sem. B. Tech. (Mechanical) :						
MEL 307	Fluid Machines	3	0	0	3	06
MEP 307	Fluid Machines Lab.	0	0	2	2	02
MEL 309	Machine Design – II	3	0	0	3	06
MEP 309	Machine Design-II Lab.	0	0	2	2	02
MEL 310	Manu. Process & Automation	3	0	0	3	06
MEP 310	Manu. Process & Automation	0	0	2	2	02
MEL 423	Meas.& Signal Processing	3	0	0	3	06
MEL 445	Automation in Production	3	0	0	3	06
MEP 445	Automation in Production (Lab)	0	0	2	2	02
MEL 415	Mechanical Vibration	3	0	0	3	06
MEL 424	Industrial Engg. & Management	3	0	0	3	06
MEL 429	Renewable Energy Sources	3	0	0	3	06
Mel 407	Bio-Mechanics	3	0	0	3	06
MEL412	Air Conditioning	3	0	0	3	06
VII Sem. B. Tech. (Mechanical) :						
MED401	Project Phase-I (B. Tech.)	-	-	-	-	04
MEL 311	Metrology & Quality Assurance	3	0	0	3	06
MEP 311	Metrology & Quality Assurance	0	0	2	2	02
MEL 410	CAD	3	0	0	3	06
MEP 410	CAD Lab.	0	0	2	2	02
MEL 430	Adv. I. C. Engine	3	0	0	3	06
MEP 430	Adv. I. C. Engine	0	0	2	2	02
MEL 432	Computer Graphics and Solid Modelling	3	0	0	3	06
MEP 432	Computer Graphics and Solid Modelling	0	0	2	2	02
MEL435	Computational Fluid	3	0	0	3	06

	Dynamics					
MEL 425	Reliability & Maint.Engg.	3	0	0	3	06
MEL 439	Product Design and Development	3	0	0	3	06
MEL 437	Composite Material	3	0	0	3	06
MEL-418	Adv. Stress Analysis	3	0	0	3	06
MEL-428	Machine Tool Design	3	0	0	3	06
MEL-411	Energy Management	3	0	0	3	06
MEL401	Control System	3	0	0	3	06
MEL403	Operation Research	3	0	0	3	06
VIII Sem. B. Tech. Mechanical :						
MEL422	Automobile Engineering	3	0	0	3	06
MEP422	Automobile Engineering Lab.	3	0	0	3	06
MEL426	Refrigeration & Cryogenics	3	0	0	3	06
MEP 426	Refrigeration & Cryogenics Lab	0	0	2	2	02
MEL420	Finite Element Method	3	0	0	3	06
MEP420	Finite Element Method Lab.	0	0	2	2	02
MEL 441	Computers & Database Management	3	0	0	3	06
MEP 441	Computers & Database Management (Lab)	0	0	2	2	02
MEL444	Solar Energy Utilization	3	0	0	3	06
MEL413	Fracture Mechanics	3	0	0	3	06
MEL 443	Air Pollution Control	3	0	0	3	06
MEL405	Optimization	3	0	0	3	06
MEL 447	Advanced Turbo machinery	3	0	0	3	06
MEL 446	Artificial Intelligence in Manufacturing	3	0	0	3	06
MED402	Project Phase-II	-	-	-	-	08

: 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)

Course Code	**Title of the Course**	**Pre-requisite**
MEC101	Engineering Drawing	Nil
MAL 201	Integral Transform & PDE	Nil
MEL 201	Theory of Machine – 1	Nil
MEL 202	Fluid Mechanics	Nil
MEP 202	Fluid Mechanics Lab	Nil
MEL 203	Engg. Thermodynamics	Nil

MEL 204	Engg. Metallurgy	Nil
MEP 204	Engg. Metallurgy Lab.	Nil
MEL 206	Solid Mechanics	Nil
MEL 207	Manufacturing Process – I	Nil
MEP 207	Manufacturing Process – I Lab	Nil
MEL 301	Theory of Machine – II	Nil
MEP 301	Theory of Machine – II Lab	Nil
MEL 302	Heat Transfer	Engineering Thermodynamics
MEP 302	Thermal Lab.	Engineering Thermodynamics
MEL 303	Energy Conversion – I	MEL203
MEL 304	Machine Design – I	MEL206, Solid Mechanics
MEP 304	Design Lab	Nil
MEL 305	Manufacturing Process - II	Nil
MEP 305	Manufacturing Process – II Lab.	Nil
MEL 306	Machine Drawing	Nil
MEP 306	Machine Drawing Lab.	Nil
MEL 307	Fluid Machines	Fluid statics & Dynamics
MEP 307	Fluid Machines Lab.	Fluid statics & Dynamics
MEL 308	Energy Conversion – II	Engineering Thermodynamics
MEP 308	Energy Conversion – II Lab.	Engineering Thermodynamics
MEL 309	Machine Design – II	MD-I, Solid Mechanics
MEP 309	Machine Design-II Lab.	MD-I
MEL 310	Manu. Process & Automation	Nil
MEL 311	Metrology & Quality Assurance	Nil
MEP 311	Metrology & Quality Assurance Lab.	Nil
MEL401	Control System	Nil
MEL403	Operation Research	Nil
MEL405	Optimization	Nil
MEL 407	Biomechanics	Engg.Mechanics, Solid Mechanics
MEL408	Supply Chain Management	Nil
MEL 410	CAD	Computer Graphics & Solid Modeling
MEP 410	CAD	Computer Graphics & Solid Modeling
MEL-411	Energy Management	Nil
MEL412	Air Conditioning	Nil
MEL413	Fracture Mechanics	Solid Mechanics
MEL 414	Tribology	Machine Design-I
MEL 415	Mechanical Vibration	Theory of Machines-II
MEL 416	Industrial Robotics	Nil
MEL 417	Power Plant Engineering	Engineering Thermodynamics
MEL-418	Adv. Stress Analysis	Solid Mechanics
MEL 419	Pressure Vessel Design	Nil
MEL420	Finite Element Method	Solid Mechanics
MEP420	Finite Element Method Lab.	Solid Mechanics
MEL422	Automobile Engineering	Machine Design-II
MEP422	Automobile Engineering Lab.	Machine Design-II
MEL 425	Reliability & Maintenance Engg.	Nil
MEL426	Refrigeration & Cryogenics	Engineering Thermodynamics

MEP 426	Refrigeration & Cryogenics Lab	Engineering Thermodynamics
MEL-428	Machine Tool Design	Machine Design-II, TOM-II
MEL 430	Adv. I. C. Engine	EC-II
MEP 430	Adv. I. C. Engine	EC-II
MEL 431	Advanced Mechanisms (CAD/CAM)	TOM-I
MEL 432	Computer Graphics and Solid Modelling	Nil
MEL435	CFD	Fluid Dynamics, Vector Calculus
MEL438	Adv. Ref. & Cryogenics	Engineering Thermodynamics
MEP438	Adv. Ref. & Cryogenics	Engineering Thermodynamics
MEL 439	Product Design and Development	Nil
MEL 441	Computers & Database Mgt.	Nil
MEP 441	Computers & Database Management (Lab)	Nil
MEL 443	Air Pollution Control	EC-II
MEL444	Solar Energy Utilization	Basic Thermo. & Maths
MEL 445	Automation in Production	MPA, MQA
MEP 445	Automation in Production Lab.	MPA, MQA
MEL 446	Artificial Intelligence in Manufacturing	Nil
MEL 447	Advanced Turbo machinery	Fluid Statics & Dynamics
MEL424	Ind. Engg. & Management	Nil
MEL432	Mechanical Measurement & Signal Processing	Nil
MEL429	Renewable Energy Sources	Heat Transfer
MEL421	Computational Methods in Engg.	Nil
MED401	Project Phase - I	Nil
MED402	Project Phase-II	Nil

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)

Sr. No.	Programme Specific Criterion specified by ASME	Compliance
I	**Curriculum** : The curriculum must require students to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations); to model, analyze, design, and realize physical systems, components or processes; and prepare students to work professionally in both thermal and mechanical systems areas.	As seen from POs of the current programme a, b, c, d, e, f, g, h, I, j, k stated earlier, all the programme specified criterion(PSC) are met.
II	**Faculty** :	As seen from the faculty contribution (section 5) this PSC is also met with programme specific criterion.

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	7%	11	22	a, b,d,e,i,j,k	I,II
Basic sciences	5%	10	16	a,b,c,d,k	I,II,III
Engineering science	9%	20	28	a,b,c,d,e,g,i,j,k	I,II,III
Computing	2%	4	8	a,b,c,d,e,i,j,k	I,II,III
Humanities	3%	5	10	d,f,g,h,i	IV,V,VI
Professional core + Project	46%	80	146	a,b,c,d,e,f,g,h,i,j,k	I,II,III,IV,V,VI
Elective	28%	45	90	a,b,c,d,e,f,g,h,i,j,k	I,II,III,IV,V
Total	100%	175	320		

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

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

S. No.	e name	Course code	a	b	c	d	e	f	g	h	i	j	k
1.	Engineering Drawing	MEC101	√	√	√	√	-				√	√	-
2.	Integral Transform & PDE	MAL 201	√	√	√	√	√			√	√	√	√
3.	Theory of Machine – 1	MEL 201	√	√	√		√			√		√	√
4.	Fluid Mechanics	MEL 202	√	√		√				√			√
5.	Fluid Mechanics Lab	MEP 202	√			√	√		√	√	√		√
6.	Engg. Thermodynamics	MEL 203	√	√	√	√	√	√	√	√	√	√	√
7.	Engg. Metallurgy	MEL 204	√	√	√	√					√		√

8.	Engg. Metallurgy Lab.	MEP 204	√	√	√	√					√		√
9.	Solid Mechanics	MEL 206	√								√		√
10.	Manufacturing Process – I	MEL 207	√	√	√	√	√	√	√	√		√	√
11.	Manufacturing Process – I Lab	MEP 207	√	√	√	√	√	√	√	√		√	√
12.	Theory of Machine – II	MEL 301	√	√	√		√	√			√	√	√
13.	Theory of Machine – II Lab	MEP 301	√	√	√		√	√			√	√	√
14.	Heat Transfer	MEL 302	√	√	√	√	√			√	√	√	√
15.	Thermal Lab.	MEP 302	√	√	√	√	√		√	√	√	√	
16.	Energy Conversion – I	MEL 303	√	√	√	√	√		√	√	√		√
17.	Machine Design – I	MEL 304	√	√	√		√	√	√	√	√	√	√
18.	Design Lab	MEP 304	√	√	√	√	√			√	√	√	√
19.	Manufacturing Process - II	MEL 305	√	√	√						√	√	√
20.	Manufacturing Process – II Lab.	MEP 305	√	√	√			√			√	√	√
21.	Machine Drawing	MEL 306	√		√		√	√				√	
22.	Machine Drawing Lab.	MEP 306	√	√	√		√	√				√	
23.	Fluid Machines	MEL 307	√	√	√	√	√			√	√	√	√
24.	Fluid Machines Lab.	MEP 307	√	√	√	√	√			√	√	√	√
25.	Energy Conversion – II	MEL 308	√	√	√	√			√	√	√	√	√
26.	Energy Conversion – II Lab.	MEP 308	√	√	√	√			√	√	√	√	√
27.	Machine Design – II	MEL 309	√	√	√							√	√
28.	Machine Design-II Lab.	MEP 309	√	√	√							√	
29.	Manu. Process & Automation	MEL 310	√	√	√							√	√
30.	Metrology & Quality Assurance	MEL 311	√	√	√								√
31.	Metrology & Quality Assurance Lab.	MEP 311		√	√							√	√
32.	Control System	MEL401	√	√	√	√	√			√	√	√	√
33.	Operation Research	MEL403		√			√						
34.	Operation Research	MEP403		√			√						
35.	Optimization	MEL405	√	√	√	√	√			√	√	√	√

36.	Industrial Engg. & Mgt.	MEL424	√	√	√	√	√	√	√	√	√	√	
37.	Biomechanics	MEL 407	√			√			√			√	√
38.	Supply Chain Management	MEL408	√	√		√	√		√		√	√	
39.	CAD	MEL 410	√	√	√	√	√		√		√	√	√
40.	CAD	MEP 410	√	√	√	√	√		√		√	√	√
41.	Energy Management	MEL-411	√		√	√			√	√	√	√	√
42.	Air Conditioning	MEL412	√	√	√	√	√	√		√	√	√	√
43.	Fracture Mechanics	MEL413	√	√	√	√	√	√	√	√			
44.	Tribology	MEL 414	√	√		√	√			√	√	√	
45.	Mechanical Vibration	MEL 415	√	√	√	√	√			√	√	√	√
46.	Industrial Robotics	MEL 416	√	√	√	√					√	√	
47.	Power Plant Engineering	MEL 417	√		√		√	√		√			√
48.	Advanced Stress Analysis	MEL 418	√	√	√							√	√
49.	Finite Element Method	MEL420	√		√	√						√	√
50.	Finite Element Method Lab.	MEP420	√		√	√						√	
51.	Automobile Engineering	MEL422	√	√	√		√	√		√		√	√
52.	Automobile Engineering Lab.	MEP422	√	√	√		√	√		√		√	√
53.	Reliability & Maintenance Engg.	MEL 425	√		√	√	√	√	√	√	√	√	
54.	Refrigeration & Cryogenics	MEL426	√	√	√	√	√	√		√	√	√	√
55.	Refrigeration & Cryogenics Lab	MEP 426	√	√	√	√	√	√		√	√	√	√
56.	Machine Tool Design	MEL-428	√	√	√		√	√		√			√
57.	Adv. I. C. Engine	MEL 430	√	√	√	√			√	√	√	√	√
58.	Adv. I. C. Engine	MEP 430	√	√	√	√			√	√	√	√	√
59.	Advanced Mechanisms	MEL 431	√	√	√							√	√
60.	Computer Graphics and Solid Modelling	MEL 432	√	√	√		√			√	√		
61.	CFD	MEL435	√	√	√	√	√			√	√		
62.	Product Design and Development	MEL 439		√	√	√		√	√	√	√	√	
63.	Computers &	MEL 441	√		√	√	√				√	√	

	Database Management												
64.	Computers & Database Management (Lab)	MEP 441	√		√	√	√				√	√	
65.	Air Pollution Control	MEL 443	√	√	√	√			√	√	√	√	√
66.	Solar Energy Utilization	MEL444	√	√	√	√	√		√	√	√	√	√
67.	Automation in Production	MEL 445		√	√							√	
68.	Automation in Production (Lab)	MEP 445		√	√							√	
69.	Artificial Intelligence in Manufacturing	MEL 446	√		√	√	√				√	√	√
70.	Advanced Turbo machinery / Engg. Economics	MEL 447	√	√	√	√	√			√	√		
71.	Measurement & Signal Processing	MEL432	√		√						√	√	√
72.	Measurement & Signal Processing	MEL432	√		√						√	√	√
73.	Project Phase - I	MED401	√	√	√	√	√		√	√		√	
74.	Project Phase - II	MED402	√	√	√	√	√		√	√		√	

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. Department Alumni is in very high position in Industry.
2. The BoS in Mechanical engineering has one member from industry.
3. Persons from industries visit VNIT for delivering expert lecture as per mutual convenient.
4. Students are permitted to take up internship at various industries as per the company's eligibility requirements.
5. Almost all students undertake summer vacation training **although not mandatory**.

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)

1. Inputs from other prestigious institutes such as IITs etc., students, alumni and industries were considered while framing the curriculum/syllabus.

2. Since PEOs and POs have now been explicitly defined, hereafter the changes in the curriculum/syllabus/proposing new courses will be made keeping in view the PEOs and POs.

3. These changes will be discussed in the BOS and later on put to 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 provide the evidence of continuous improvement of courses and curriculum)

1. The improvement in courses and curricula are self driven through assessment and discussions in the class committee meeting.
2. It is also affected through student's feedback and feedback from T&P section.
3. Suggestions from different stake holders are also be considered.

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: **(ANNEXURE I)**

- 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

4.Students' Performance (75)

Admission intake in the programme :

Item	2012-13	2011-12	2010-11	2009-10
Sanctioned intake strength in the program (N)**	101	104	104	94
Total number of admitted students in first year minus number of students migrated to other programs at the end of 1st year (N1)	nil	nil	nil	Nil
Number of admitted students in 2nd year in the same batch via lateral entry (N2)	nil	nil	nil	Nil
Total number of admitted students in the program (N1+N2)	101	104	104	94

** Including DASA students

4.1 Success Rate (20) :

Year of entry (in reverse	DASA+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
2012-13	101	100	89	94	70
2011-12	104	89	94	70	69
2010-11	104	94	70	69	56
2009-10	94	70	69	56	nr
2008-09	80	69	56	nr	nr
2007-08	64	56	nr	nr	nr
2006-07	63	nr	nr	nr	nr

*: Successfully completed implies zero backlogs.

**: Including DASA students

Success rate = 20 × mean of success index (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	2012-13	2011-12	2010-11
Number of students admitted in the corresponding First year + laterally admitted via lateral entry in 2nd year	94	80	64
Number of students who have graduated in the stipulated period	70	69	56
Success Index (SI)	0.74	0.86	0.88

Average SI = 0.83, **Success Rate = 20* Average SI = 16.6**

4.2. Academic Performance (20)

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

Item	**2012-13**	**2011-12**	**2010-11**
API	7.51	7.44	7.69
Assessment	15.02	14.88	15.38
Average assessment for three years	15.09		

Assessment = 2 x API

Average Assessment for three years =15.09

4.2.1. Placement and Higher Studies (20) :

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

where, x = Number of students placed

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

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

Item	**2012-13**	**2011-12**	**2010-11**
Number of admitted students corresponding to LYG including lateral entry (N)	94	80	64
Number of students who obtained jobs as per the record of placement office (x)	66	63	49
Number of students who found employment otherwise at the end of the final year (y)	-	-	-
x = x1 + x2	66	63	49
Number of Students who opted for higher studies with valid qualifying scores/ranks (y)	-	-	-
Assessment Point	14.04	15.75	15.31
Average assessment points = 15.03			

4.3. Professional Activities (15) :

4.3.1 Professional Societies / Chapters and organising engineering events

a) **SAE Club** :

Mechanical Engineering Students have formed SAE club which undertake activities like

1) Training in Automobile Design Procedures
2) Computational Skill Development in modelling and analysis in Mechanical Structures using software like PrO-Enginner, CATIA, ANSYS

2010 -11:

Participated in ASE Supra Event- Where students have built racing car by their own and performed the static, dynamic and endurance test of the vehicle on track.
25 Students have participated in it.
Car made by student won first prize in "acceleration" test cash prize of 50,000/-Rs.
Faculty Advisor: Dr. A. B. Andhare, Accompanying Faculty: Dr. H. P. Jawale

2011 -12:

Participated in SAE Supra Event- Where students have built racing car by their own and performed the static, dynamic and endurance test of the vehicle on track.
25 Students have participated in it.
Car made by student won second prize in "Least cost vehicle", cash prize of 25,000/-Rs.
Faculty Advisor: Dr. A. B. Andhare, Accompanying Faculty: Dr. H. P. Jawale

List of Participants SAE Supra 2011-12			
S. N	**Name of Student**	**Responsibility**	**Head**
1	VIKAS POUL (CAPTAIN)	BRAKES	PERSONAL MANAGEMENT
2	YUVRAJ PHALE (V/ CAPT)	SUSPENSION	PERSONAL MANAGEMENT
3	MAYUR SHERKHANE	STEERING	DOCUMENTATION
4	SUDARSHAN IYER	AERODYNAMICS	AESTHETICS
5	NIKHIL SAWANT	SUSPENSION	DESIGN VALIDATION
6	KUNAL MHAPSEKAR	SUSPENSION	DFMA
7	PRASAD SAPKAL	MANUFACTURING	SUPPLY CHAIN
8	SANCHIT AGARWAL	PROD. PLANNING	SPONSORSHIP
9	SUSHIL DHARMADHIKARI	AERODYNAMICS	COOLING SYSTEM
10	AVI JHAMARIA	COSTING & ACCOUNTS	SPONSORSHIP
11	KALPANA SINGH	TRANSMISSION	DFMA
12	MIHIRR SOSE	ROLL CAGE	DRIVER 1
13	UTKARSH GARG	ROLL CAGE	CHASSIS
14	ADITYA KOLESHWAR	SUSPENSION	SEAT MOUNTING
15	VIJAY KUMAR	FUEL AND EXHAUST	COOLING SYSTEM
16	HRISHIKESH SARAWATE	TRANSMISSION	CHASSIS
17	ANUP CHAUDHARI	AERODYNAMICS	IMPACT ATTENUATOR
18	PRAVEEN PURAM	ERGONOMICS	SEAT MOUNTING
19	PINAKI MOHANTY	BRAKES	STRUCTURE ANALYSIS
20	JUNAID SHEIKH	ERGONOMICS	STRUCTURE ANALYSIS
21	SANIDHYA MENDIRATTA	AERODYNAMICS	SAFETY
22	SARANG PATANGE	FUEL AND EXHAUST	AESTHETICS
23	SUMANT VANAGE	BRAKES	ELECTRICAL SYSTEMS
24	HARSHAL ZALKE	STEERING	DRIVER 2
25	NITANSH PARIKH	STEERING	RULEBOOK CHECK

b) **Participated in SAE Baja Event**: Here the students make all terrain car by their own and perform the static, dynamic and endurance test of the vehicle on track.
25 Students have participated in it.
Faculty Advisor: Dr. H. P. Jawale

List of Participants SAE Baja 2011-12	
S. N	**Name of Student**
1	VIKAS POUL (CAPTAIN)
2	YUVRAJ PHALE (VICE-CAPTAIN)
3	MAYUR SHERKHANE
4	SUDARSHAN IYER
5	NIKHIL SAWANT
6	KUNAL MHAPSEKAR
7	PRASAD SAPKAL
8	SANCHIT AGARWAL
9	SUSHIL DHARMADHIKARI
10	AVI JHAMARIA
11	KALPANA SINGH
12	MIHIRR SOSE
13	UTKARSH GARG
14	ADITYA KOLESHWAR
15	VIJAY KUMAR
16	HRISHIKESH SARAWATE
17	ANUP CHAUDHARI
18	PRAVEEN PURAM
19	PINAKI MOHANTY
20	JUNAID SHEIKH
21	SANIDHYA MENDIRATTA
22	SARANG PATANGE
23	SUMANT VANAGE
24	HARSHAL ZALKE
25	NITANSH PARIKH

2012 -13:
a) **Participated in ASE Baja Event** : Where students makes all terrain car by their own and performs the static, dynamic and endurance test of the vehicle on track.
25 Students have participated in it.
This year, team was disqualified.
Faculty Advisor: Dr. H. P. Jawale

4.3.2 Organisation of paper contest, design contest and achievements
4.3.3 Publication of Technical Magazines, newsletters etc.

As per the Institute policy, only three activities (by students) are supported by the Institute, namely, (i) Aarohi-Inter collegiate cultural programme, (ii) Institute gathering and (iii) Axis- Technical Festival. No other activities, other than these are encouraged by the Institute. Students of Mech Engg Dept have worked as coordinators for many activities in these events.

4.3.4 Entrepreneurship activities, product design and innovations

NIL

4.3.5 Publications and Awards in inter institute events by students of programme of study

a. SAE Supra team stood first in “Acceleration” test on track in 2011, and received first prize ofRs 50,000/-
b. SAE Supra team stood second in “Most Cost effective Design of Racing Car” evaluation on track in 2012, and received second prize of Rs. 25,000/-
c. Akshay Khatri - BT11MEC012 - Secured first position in paper presentation competition conducted in technical festival AXIS '13. Paper on “Spherical Robot with two Pendulum Driving Mechanism”.
d. Vaibhav Borakar - BT11MEC021 - won the first prize in article writing competition in cultural festival of the college Aarohi '13.
e. A group of students were short listed in top 10 teams from around the nation in a social awareness presentation event conducted by an NGO by the name of CAG '13

   Urjit Agarwal - BT11MEC006
   Chintan Dand - BT11MEC026
   Debojyoti Sanyal - BT11MEC067
   Siddhant Goyal - BT11MEC075

f. Tushar Dhanwani - BT11MEC083 - Placed first in Radio-controlled IC engine car racing event organised in technical festival AXIS '13.
g. Mayuresh Huchche - BT11MEC054 - Placed first in chess championship held at the Inter-NIT Sports Meet 2012.

5. Faculty Contributions (175)

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

(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 × 15/STR; subject to maximum assessment of 20

STR = (x + y + z)/N1

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

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

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

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

Year	x *	y*	z*	x+y+z	N1	STR	Assessment (Max. is 20)
2012-13	92	92	92	276	13.65	20.22	14.84
2011-12	92	92	92	276	15.34	17.99	16.68
2010-11	92	92	92	276	14.59	18.92	15.86
						Average Assessment	15.79 ≈ 16

*excluding DASA students.

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)
2012-13	13.90	18.4	18.4 ≈ 18
2011-12	15.34	18.4	18.4 ≈ 18
2010-11	14.59	18.4	18.4 ≈ 18

5.2. Faculty Cadre Ratio (20)

Assessment = 20 × CRI
where, CRI = Cadre ratio index
= 2.25 × (2x + y)/N; subject to max. CRI = 1.0
where, x = Number of professors in the programme
y = Number of associate professors in the programme

Year	x	y	N	CRI	Assessment
2012-13	5	6	18.4	1	20
2011-12	5	5	18.4	1	20
2010-11	7	5	18.4	1	20
				Average Assessment	20

5.3. Faculty Qualifications (30)

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

Year	x	y	z	N2	FQI	Assessment
2012-13	9.95	3.7	0	18.4	6.61	19.83
2011-12	7.62	7.72	0	18.4	6.66	19.98
2010-11	8.27	6.32	0	18.4	6.56	19.68
					Average Assessment	19.83

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)

Name of Faculty	Specialization	Publication	Competency for POs
Dr. S.B. Thombre	Thermal	34	a,b,c,d,e,h,i,j,k
Dr.I.K.Chopde	Industrial	21	a,b,c,d,g, f h,i,j,k
Dr.P.M.Padole	Machine Design	105	a,b,c,d,e,h,i,j,k
Dr.Animesh Chatterjee	Machine Design	25	a,b,c,d,e,h,i,j,k
Dr. A.M.Kuthe	Machine Design	50	a,b,c,d,e,h,i,j,k
Dr.S.V.Bopshetty	Thermal	3	a,b,c,d,e,h,i,j,k
Dr.D.B.Zodape	Thermal	22	a,b,c,d,e,h,i,j,k
Dr.A.B.Andhare	Machine Design	16	a,b,c,d,e,h,i,j,k
Dr.Y.M.Puri	Industrial	45	a,b,c,d,e,h,i,j,k
Dr.J.G.Suryawanshi	Thermal	28	a,b,c,d,e,h,i,j,k
Dr. V.R.Kalamkar	Thermal	8	a,b,c,d,e,h,i,j,k
Dr.R.V.Udanwadikar	Machine Design	41	a,b,c,d,e,h,i,j,k
Dr. A.S.Dhobde	Machine Design	8	a,b,c,d,e,h,i,j,k
Mr.V.M.Nistane	Machine Design	Nil	a,b,c,d,e,h,i,j,k
Mr.M.S.Kotambkar	Machine Design	1	a,b,c,d,e,h,i,j,k
Mr.A.A.Thakre	Machine Design	4	a,b,c,d,e,h,i,j,k
Dr.H.P.Jawale	Machine Design	6	a,b,c,d,e,h,i,j,k
Mr.K.M.Asthankar	Industrial	7	a,b,c,d,e,h,i,j,k
Mr.P.V.Kane	Industrial	5	a,b,c,d,e,h,i,j,k
Dr. Shittal S.Chiddarwar	Machine Design	2	a,b,c,d,e,h,i,j,k
Dr. A.K.Singh	Machine Design	3	a,b,c,d,e,h,i,j,k

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

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

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

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

Name of faculty	Max. 5 per faculty		
	2012-13	**2011-12**	**2010-11**
Dr. S.B. Thombre	0	3	0
Dr.I.K.Chopde	0	0	0
Dr.P.M.Padole	5	0	0
Dr.Animesh Chatterjee	0	0	5
Dr. A.M.Kuthe	0	5	0
Dr.S.V.Bopshetty	0	0	0
Dr.D.B.Zodape	0	0	0
Dr.A.B.Andhare	0	5	0
Dr.Y.M.Puri	0	0	0
Dr.J.G.Suryawanshi	0	0	0
Dr. V.R.Kalamkar	5	0	0
Dr.R.V.Udanwadikar	5	5	5
Dr. A.S.Dhobde	5	5	0
Mr.V.M.Nistane	5	5	5
Mr.M.S.Kotambkar	5	5	5
Mr.A.A.Thakre	5	5	5
Dr.H.P.Jawale	5	5	5
Mr.K.M.Asthankar	5	5	5
Mr.P.V.Kane	5	5	5
Dr.S. Dhandole	0	0	0
Mr.N. Lautre	0	0	5
Mr.P.D.Sawarkar	0	5	5
Dr. Shittal S.Chiddarwar	5	0	0
Dr. A.K.Singh	5	0	0
sum	60	60	50
N(Number of faculty positions required for an STR)	18.4	18.4	18.4
Assessment = 3x Sum/N	9.78	9.78	8.15
		Average assessment	9.24 ≈ 09

5.6. Faculty Retention (15)

Assessment =3 × RPI/N

where RPI = Retention point index

=Pointsassigned 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	2012-13	2011-12	2010-11
Number of faculty with experience of less than l year (X_0)	1	0	0
Number of faculty with 1 to 2 years experience	0	0	0
Number of faculty with 2 to 3 years experience	0	0	1
Number of faculty with 3 to 4 years experience	0	1	1
Number of faculty with 4 to 5 years experience	1	1	0
Number of faculty with more than 5 years experience (X_5)	19	21	21
N	21	23	23
RPI = $X1+2X_2 + 3X_3 + 4X_4 + 5X_5$	99	112	110
Assessment	14.14	14.61	14.35
Average assessment			14.37

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)**		
	2012-13	2011-12	2010-11
Dr. S.B. Thombre	5	5	5
Dr.I.K.Chopde	5	5	0
Dr.P.M.Padole	5	5	0
Dr.Animesh Chatterjee	5	5	5
Dr. A.M.Kuthe	0	5	5
Dr.S.V.Bopshetty	0	0	0
Dr.D.B.Zodape	0	5	0
Dr.A.B.Andhare	0	5	5
Dr.Y.M.Puri	5	5	0
Dr.J.G.Suryawanshi	0	5	0
Dr. V.R.Kalamkar	5	0	0
Dr.R.V.Uddanwadikar	0	5	5
Dr. A.S.Dhobde	5	0	0
Mr.V.M.Nistane	5	5	0
Mr.M.S.Kotambkar	0	5	0
Mr.A.A.Thakre	5	0	0
Dr.H.P.Jawale	0	5	0
Mr.K.M.Asthankar	0	5	0
Mr.P.V.Kane	5	0	0
Dr.S. Dhandole	0	0	5
Mr.N. Lautre	0	0	0
Mr.P.D.Sawarkar	5	0	0
Dr. Shittal S.Chiddarwar	5	0	0
Dr. A.K.Singh	5	0	0
sum	65	70	20
N(Number of faculty position required for an STR of 15)	18.4	18.4	18.4
Assessment FRP = 4x Sum/N	14.13	15.22	4.35
		Average assessment	11.23

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)**		
	2012-13	**2011-12**	**2010-11**
Dr. S.B. Thombre	5	0	0
Dr. A. M. Kuthe	5	0	0
Sum	10	0	0
N	18.4	18.4	18.4
Assessment FIPR = 2x Sum/N	1.1	0	0
Average assessment			0.37

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)**		
	2012-13	**2011-12**	**2010-11**
Dr. P. M. Padole	5	5	5
Dr.A. M. Kuthe	0	0	5
Sum	10	5	10
N	18.4	18.4	18.4
Assessment FPPC = 4x Sum/N	1.1	1.1	2.2
Average assessment			1.5

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**		
	2012-13	2011-12	2010-11
NA	--	--	--
	--	--	--
Sum	--	--	--
N	--	--	--
Assessment FIP = 2x Sum/N	--	--	--
		Average assessment	Nil

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	Room No.	usage	Shared/exclusive	Size (mxm)	multi media projector
Classroom	M-1-2	M.Tech Heat Power	Exclusive for core shared for elective	5 x 7.5	No
Classroom	M-1-3	M.Tech (Industrial Engg)classroom	Exclusive for core shared for elective	5 x 7.5	No
Classroom	M-1-4	Classroom (IInd Year)	Exclusive for core shared for elective	10 x 12	Yes
Classroom	M-1-5	Classroom (Final Year Electives)	Exclusive for core shared for elective	10 x 9	Yes
Classroom	M-1-6	Classroom (IIIrd Year)	Exclusive for core shared for elective	10 x 14	Yes
Classroom	M-1-7	Classroom (Engineering Drawing Pract/ Electives)	Exclusive for core shared for elective	10 x 9	No
Classroom	M-1-8	Classroom (Engineering Drawing Pract/ Electives)	Exclusive for core shared for elective	10 x 7	No
Classroom	M-1-9	Classroom (Engineering Drawing Pract/ Electives)	Exclusive for core shared for elective	10 x 8	No
Classroom	WS-1-1	M.Tech Heat power	Exclusive for core shared for elective	7 x 6	No
Classroom	WS-1-2	M.Tech Industrial engg	Exclusive for core shared for elective	7 x 6	No
Classroom	WS-1-3	M.Tech CAD- CAM	Exclusive for core shared for elective	7 x 6	No
No. of seminar rooms	02	For UG , PG and PhD students seminar and Guest lectures	Shared / exclusive	7 x 11	Yes

Meeting Rooms

No. of Meeting Rooms	01	Departmental Meetings	for BOS, other departmental Meetings	30	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)

i) Condition of Chairs / Benches : Good in all the Class rooms.
ii) Enough ventilation is provide
iii) Lighting : sufficient
iv) Ambience : Good
v) Acoustics : Natural

(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 following table.)
- *Every faculty is provided with an exclusive faculty room.*

6.2.2. Room equipped with white/black board, computer, Internet, and such other amenities/facilities (5)
See table below
(Instruction: Assessment based on the information provided in the following table)

6.2.3. Usage of room for counselling/discussion with students (5)
Faculty rooms are used for discussion with students as and when needed.
(Instruction: Assessment based on the information provided in the following table and the inspection thereof.)

No. of Faculty Rooms	***Usage***	***Shared / exclusiv***	***Capacity***	***Room equipped with pc ,internet, book rack, Telephone***
Fluid Power	Prof. A.B. Andhare Cabin	Exclusive	01	Yes
	Ad-hoc faculty	Shared	01	Yes
M-1-1	Prof. S.V. Bopshetty Cabin	Exclusive	01	Yes
M-1-0	Prof. A. Chatterjee	Exclusive	01	Yes
IC Engine lab	Prof A. K. Singh	Exclusive	01	Yes
	Prof. J.G. Suryawanshi	Exclusive	01	Yes
Mechatronics lab	Prof. A.S. Dhoble	Exclusive	01	Yes
Mech. Measurement lab	Prof. H.P. Jawale	Exclusive	01	Yes
Heat transfer lab	Prof. S.B.Thombre	Exclusive	01	Yes
Heat transfer lab	Prof. M.S. Kotambkar	Exclusive	01	Yes
Comp. lab	Prof. V.M.Nistane	Exclusive	01	Yes
Solid mechanics lab	Prof. P.M. Padole	Exclusive	01	Yes
Metrology lab	Prof. A.A. Thakre	Exclusive	01	Yes
Machine Design lab	Prof. R.V. Uddanwadikar	Exclusive	01	Yes
RAC Lab	Prof. D.B. Zodape	Exclusive	01	Yes
Workshop	Prof. P.V. Kane	Exclusive	01	Yes
Robotics lab	Prof. S. Chiddarwar	Exclusive	01	Yes
CFD Lab	Prof. V.R. Kalamkar	Exclusive	01	Yes
CAD/CAM	Prof. Y.M.Puri	Exclusive	01	Yes
	Prof. A.M.Kuthe	Exclusive	01	Yes
	Prof. K.M. Ashtankar	Exclusive	01	Yes

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)

Laboratories are made available to the students as per their requirement
(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.)

Sr. No.	***Name of Laboratory***	**Size in m^2**	**Computational Facilities**	**No. of Experiments**
1.	IC Engine laboratory	25 x 11	No	3
2.	Ergonomics laboratory	10 x 9	No	5
3.	Fluid Power laboratory	48 x 12	No	6
4.	Mechatronics laboratory	6 x 12	Yes	6
5.	Solid Mechanics Laboratory	6 x 12	Yes	5
6.	Machine Dynamics laboratory	10 x 11	Yes	7
7.	Refrigeration and Air Conditioning laboratory	10 x 9	No	7
8.	Steam and Heat Power laboratory	22 x 11	No	7
9.	CAD / CAM Center	2 Floor (15 x 9)	Yes	7
10.	FMS laboratory	7 x 7	Yes	6
11.	Robotics laboratory	8 x 7	Yes	4
12.	Solid Modelling Laboratory	8 x 7	Yes	5
13.	Measurement Lab.	6 x 12	No	4

14.	Machine Design	6 x 12	No	5
15.	Metrology	10 x 9	No	6
16.	Computer Lab.	10 x 9	Yes	11

6.4 Technical Manpower in support of Department :

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

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

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

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

Name of Tech Staff	Designation	Exclusive / Shared Work	Date of Joining	Qualification		Other technical skills gained	Responsibility
				At Joining	Now		
V C Bhujade	Engine Tech. (b.p-RS19030) (G.P.-RS4200)	Diesel & petrol engine operating PhD, M.Tech,& Research work	21 June 1989	Diesel Mechanic& 12th pass	Same	Bio-diesel reactor fabrication	IC Engine lab, Solar lab, Heat Transfer lab, Fluid lab all type work
R G Dixit	Boiler Tech (b.p-RS13190) (G.P.-RS4200)	Boiler operating, refrigeration , lab & office work ,store department	1st Oct 1991	First class boiler operator	Same	Office work	Mech. Engg. Depart. Office & store work
Y. U. Sontakke	Assistant (sl-gr II) 11240 G.P.2800	Office work , store works	1999	M.S.W.	Same	Computer operator course	File record and paper Xeroxing , noting & drafting

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

Students' Admission

Admission intake (for information only)

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

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

Admission quality (for information only)

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

Sr. No.	Rank range (AIEEE Ranking)	2012-13	2011-12	2010-11	2009-10
01	1-20000	410	436	411	367
02	20000-40000	136	137	130	105
03	40000-60000	49	30	47	29
04	60000-80000	48	38	38	36
05	80000-100000	27	37	29	22
06	100000-150000	21	19	26	25
07	150000-200000	8	12	10	14
08	200000-300000	9	6	4	11

09	300000-400000	1	3	4	1
10	400000-500000	1	2	3	0
11	500000-600000	2	1	2	0
12	600000-700000	1	1	0	0
13	Admitted without AIEEE ranks (foreign nationals)	48	15	45	53
	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		01/07/11	Electrical	21.43	78.57	--

		Scholar)			Engg.			
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.		17/12/90	Electrical Engg.	00.00	72.22	27.78
47	S. Patnaik	Ph.D.	Associate Professor	01/06/12	Electrical Engg.	25.93	62.96	11.11
48	R. J. Satputaley	M.Tech.		18/07/08	Electrical Engg.	31.03	58.62	10.34
49	A. Dhabaley	M.Tech.		16/05/05	Electrical Engg.	27.59	44.83	27.59
50	M. S. Ballal	Ph.D.	Associate Professor	04/04/12	Electrical Engg.	14.82	85.19	--
51	Sathyan	Ph.D.		09/07/12	Electrical Engg.	46.15	53.84	--
52	D. Khare	Ph.D.		01/01/13	Electrical Engg.	61.54	38.46	--
53	Amarendra	Ph.D.		01/07013	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 Mechanics	37	47	16
69	Dr. R. S. Sonparote	Ph.D.	Associate Professor	11/08/92	Applied Mechanics	9	56	35
70	Dr. S. V. Bakre	Ph.D.	Professor	16/05/06	Applied Mechanics	23	35	42
71	Dr. Sangeeta Gadve	Ph.D.	Associate Professor	08/06/12	Applied Mechanics	75	0	25
72	Dr. D. Datta	Ph.D.	Assistant Professor	15/06/10	Applied 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 &	50	25	25

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

x = Number of faculty members with PhD

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

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

N = Number of faculty members needed for FYSTR of 25

Year	x	y	z	N	Assessment of faculty qualification
CAYm2	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 to verify circuit laws and demonstrate and reinforce concepts taught in theory classes	Good quality instruments are used. Adequate numbers of instruments are available.	Lab manuals are available for all the experiments.
B.Tech First Year General Lab	Two labs For General and optics experiments separately	NIL Demonstration through LCD Projector	Basic General Physics Experiments	Adequate Quality Four SET for each experiment	Yes, for each experiments
B.Tech 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 as listed hereare 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 time table(5)

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

Provision of tutorial classes in time table: For two subject's tutorial classes are conducted (requiring higher order concepts & their classification)

Name of the subjects with tutorials: 1. Fluid Mechanics 2. Solid Mechanics

Tutorial sheets provided: **NO**

Tutorial classes taken by faculty/teaching assistants/senior students/others: Faculty (1 for small batch size

Number of tutorials classes per subject per week: Usually 1 per week per subject per group

Number of students per tutorial class: **Approximately 25**

Number of subjects with tutorials: 2nd year, two subjects

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

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

Types of mentoring: Professional guidance/ career advancement/ course work specific/ laboratory specific/ total development.

Number of faculty mentors: **09**

Number of students per mentor: **30 students**

Frequency of meeting: At the beginning of every semester and then, need based.

Faculty Advisors: Dean (Academic Affairs) appoints faculty advisers for first year students upon their admission into the institute. From second year onward, Dean (Academic Affairs), on the basis of recommendation of the Head of the parent department appoints faculty advisers for a particular admission batch of that department.

The faculty advisors help in choosing a course to be taken by a student. In addition, he/ she assists the students in their academic development, emotional and psychological need.

In addition to this student mentor programme is initiated from this year, in this programme six student mentors (four boys and two girls) form third year have been allotted first year

15 students of the same branch. More over one faculty member is assigned as a faculty coordinator. student mentors and faculty coordinator help the students as and when need arises to cope up various issues like examination performance, health, etc.

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

(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).

Feedback is collected for all courses in the prescribed format.

Specify the feedback collection process: At the end of semester, the DEC collects the feedback from the students and submit it to the head of the department who in turn compiles subject vice feedback & informs observations to the concerned faculty members. If needed faculty members makes rectification /changes accordingly.

Percentage of students participating: Almost the entire class

Specify the feedback analysis process: HOD evaluates the feedback form and as and when required, concerned teacher is counselled.

Basis of reward/ corrective measures, if any: Teachers having a poor feedback are counselled by the HOD.

Number of corrective actions taken in the last three years: Conveyed to the teachers on case to case basis.

7.2.4. Scope for self-learning (5) :

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

Many e-learning materials, journal and magazine are subscribed and made available to the student at the Institute Library to help the students inculcating the habit of self-learning. Moreover, provision of Internet in the hostels also helps the students to learn beyond what is taught in the classroom. Students are encouraged to use the self learning materials in the Institute.

In addition to this NPTEL, WiFi and various software are available for student reference.

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

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

Laboratories and Library is made available beyond working hours to help the students in self-learning.

The campus is almost residential which enables learning beyond working hours with formal and informal interaction with faculty and peer groups.

Student are encouraged to involve themselves in various co-curricular and extra-curricular activities at Institute and Department level like MES, AXIS, AROHI, etc. Many eminent personalities are invited to interact with students on many occasions to help students learn recent trends in engineering, technology and practices.

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 higher studies, industry interaction for training/internship/placement, Entrepreneurship cell and incubation facility and impact of such systems)

Institute has a dedicated Training and Placement (T&P) Cell under the supervision of a senior faculty. The affairs of the T&P Cell are managed by a Placement Team drawn from pre-final year student under the overall supervision of the faculty in charge. The cell maintains liaison with employers and arranges interview for placement of undergraduates and graduates and arrange logistics for employers visiting the campus.

The Industry-Institute Interaction Cell (III Cell) maintains liaison with industries and arranges for lecture/demonstration by industry people for the benefit of students and faculty.

The persistent efforts of the T&P cell result in near placement of all eligible students in the final year.

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.)

NCC is a optional for all first year students and physical education which is compulsory course. Local NCC Directorate imparts training to students and regular camps are conducted. Students opting NCC in their first year undergo regular drills as per the NCC requirements.

In physical education sports faculty members conducts classes and teaches ground exercise, intra-moral and conducts physical efficiency test, medical test.

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

(Instructions: The instructions may specify the facilities available and usage in brief)

Institute has adequate facility to address the need of sporting talents of the students.

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.

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

8.1. Campus Infrastructure and Facility (10)

8.1.A Campus

New 1000 Seat Boys Hostel

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

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

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

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

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

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

8.1.B Administration

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

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

8.1.C Academic Programmes

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

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

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

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

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

Maintenance of Infrastructure & facilities :

The college has an extensive Infrastructure spread over 214 acres comprising of Academic Buildings, Departments, Lecture Theatres, Auditorium, Food outlets, student Residences, faculty and staff quarters, Guest House, sport fields, stadia, roads, power supply systems, Roads, Water supply, selvage disposal Network etc. A full fledged Estate Maintenance section is operational since the inception of the college. For civil maintenance as well as the supervision of new construction, Electrical Maintenance including Back up generation by Diesel Generator Telecom and Data network (ISDN & Optical Fibre) is taken care by independent units. A security section supervises the maintenance of Law & order on the campus and vicinity.

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

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

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

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

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

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

8.1.3..A Electricity:

As a self sufficient campus which is also a minor township, the entire energy requirements are under own control of the Institute. The Institute is an HT consumer getting supply from the State Electricity Board at 11 kv by UG cable/as a high priority express Feeder and is exempt from load shedding interruptions. The current maximum load demand is of the order of 1000 KVA while the total connected load is estimated at 1500 Kw at substantially unity power factor. The 200 acre Campus is served by three

substation having 3 transformers of 400 KVA each and a smaller transformer of 250 KVA. The Internal distribution to various units of the campus such as Hostel, Academic Bldgs., Residential area is entirely by underground LT cabling. As a backup to the Electricity Board supply due to unforeseen reasons beyond institute's control, a set of 2 Diesel Generators each of 250 KVA capacity is available for serving essential load such as computer/Network center Library/Administration Bldg. etc.

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

8.1.3.B Water Supply Details:

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

8.1.4 C Campus Security Section:

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

8.2. Organisation, Governance, and Transparency (10)

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

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

(A) Board of Governors

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

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. R.R Yerpude, I/C Registrar, VNIT, Nagpur	Secretary

(C) Finance Committee

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

(D) Building & Works Committee

1.	Dr. N. S. Chaudhari, Director, VNIT, Nagpur	Chairman
2.	Shri Rajesh Singh, Director Director MHRD, 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	Dean (Academics)	Upto 10 Lakhs

	year. All related expenditure of PG students & research scholars within approved budget.		
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 2012-13 in lakhs	Actual Expenses in CFY (till…) 2012-13		Budgeted in CFYm1 2011-12 in lakhs	Actual Expenses in CFYm1 2011-12		Budgeted in CFYm1 2010-11 in lakhs	Actual Expenses in CFYm1 2010-11	
		PG**	NPG*		PG**	NPG*		PG**	NPG*
Laboratory equipment		15.56547	--		0.61286	--		25.79122	--
Software		4.000			7.76584			--	--
R&D									
Laboratory consumables		6.15730			3.95568				
Maintenance and spares		5.86699						0.35847	
Training & travel		--						--	
Miscellaneous expenses for academic activities		--	1.89127			0.75742 +30296 52+1.2 7632			1.23640 +0.76116
		31.58976	1.89127		12.33438	5.33026		26.14969	2.04756
Total	**53.5**	**33.48076**		**53.0**	**17.66464**		**27.0**	**28.19725**	

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

(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	
CFYm 2 2011	41.42 Lacs (4813)	48,49,686.00	2,31,158.00		
CFYm 1 2012	53.32 Lacs (5112)	49,73,906.00	1,56,054.00		
CFY 2013	77.67 Lacs (13505	21,61,376.00	60,62,510.00		

Virtual Class Room:

DETAILS ;-

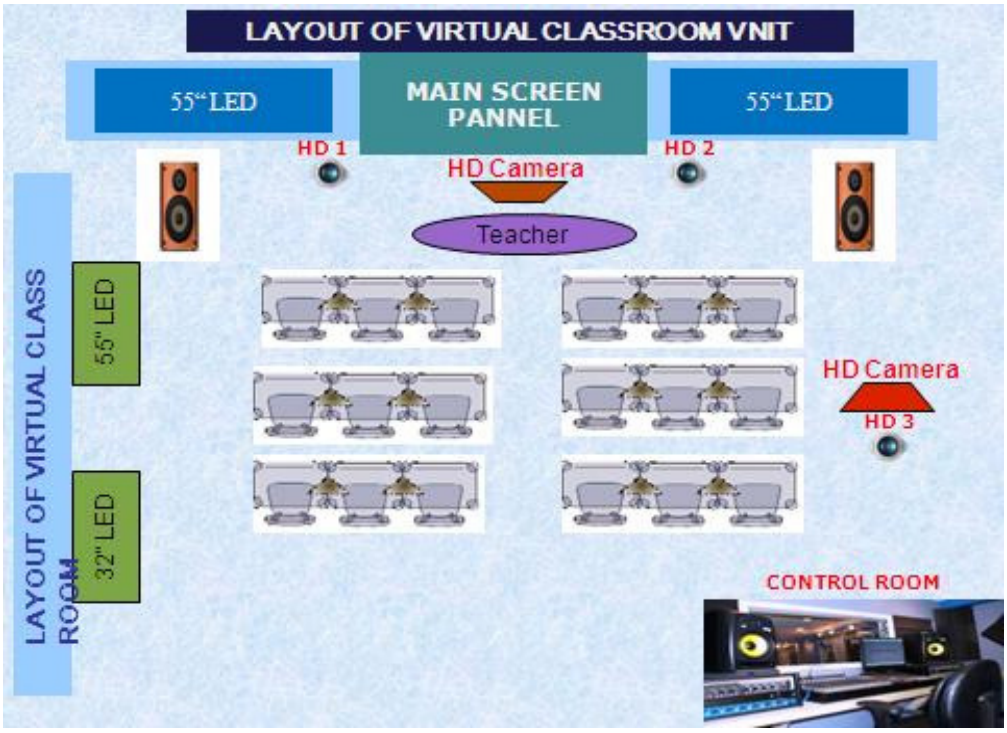
Money Given By National Informatics Center (NIC);-

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

  Speed for Video only 50 mbps
  Speed for net only 50 mbps
  Total Bandwidth 100 mbps
- Portal of NKH http;/www.nkn.in/
- IP Address for NKN;-
  - 10.119.19.194
  - 10.119.19.192/27 such Range is also allocated

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

8.5.5.1 Layout of Virtual Classroom



8.6. 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.)

8.6.1Network Center Information;-

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

Network Center has three leased line (LL) connections 10 Mbps 75 Mbps and 42 Mbps which is distributed all over campus like

departments, sections, computer center, administrative building. Guest house, health center, NCC Section, Auditorium and quarters along with Network Center, Currently NKN LL provided by NMEICT for Internet is 50 Mbps.

Network Centre monitors bandwidth usage continuously and any problems in usage are rectified with the help of ISP (Internet Service Provicer)

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

Network Center provides advanced and special purpose softwares such as ANSYS, MATLAB, EXATA and AUTOCAD as well as NPTEL Videos for all the inside users in campus. Microsoft OS Software License for servers. Network Center also host mirrors of freeware softwares for all campus users. The documentation is also provided for special purpose software regarding installation on end user computer. Powerlingo language software is available for the benefit of students.

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

Network center has hardware such as core switch, blade chasis, Blade server, Rack mount server, SAN Storage, Lenovo All in one Desktops, HP Laserjet M 1536 DNF Printer, Lenovo MAKE Desktop, HP Dual CPU Server, Netscreen Firewall, Check Point UTM, HP-ML-370 G4 Server Dual Processor.

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

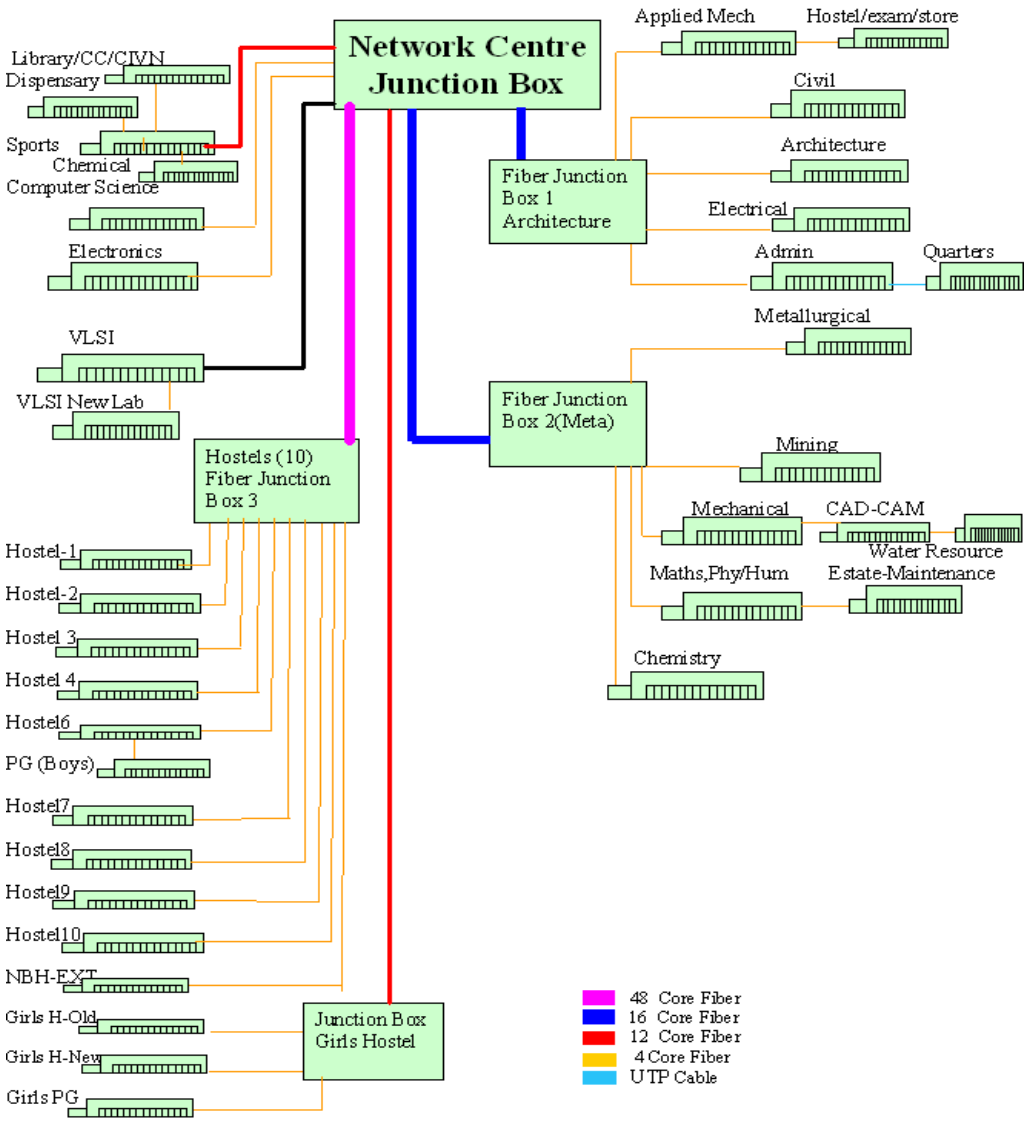
The annual charges of Reliance LL is approximately twenty five lakhs (Rs. 25,00,000) and that of BSNL LL is around ten lakhs (Rs. 10,00,000/-)

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

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

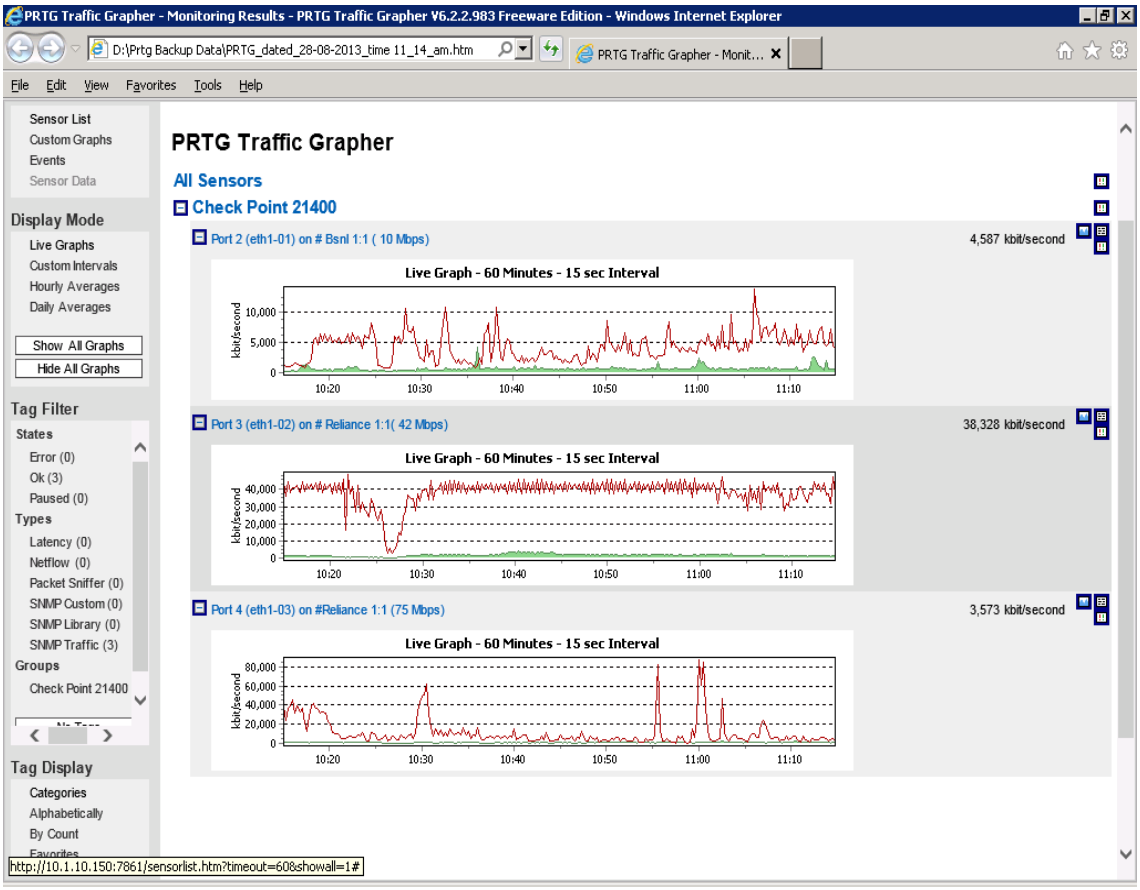
8.6.2Physical Layout of Fiber Optic Cable of VNIT

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

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

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

Date : 10/07/2013

sd/-
ENGINEER
ESTATE MAINTENANCE SECTION
V.N.I.T. NAGPUR

8.7.4. 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.

<u>Participation of students in different games</u>

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.

<u>Sports facilities currently available on the Campus</u>

- 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

	2012-13	2011-12	2010-11	
Items	LYG	LYGm1	LYGm2	Assessment
Success Index	0.74	0.86	0.88	4

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

From 4. 2

	2012-13	2011-12	2010-11	
Items	LYG	LYGm1	LYGm2	Assessment
API	7.51	7.44	7.69	37.63

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

From 5. 1

Items	2012-13	2011-12	2010-11	Assessment
STR	20.22	17.99	18.92	96.51

9.4. Enhancement of Faculty Qualification Index (5) :

From 5. 3

Items	2012-13	2011-12	2010-11	Assessment
FQI	6.61	6.66	6.56	**33.1**

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

From 5.7and 5.9

Items	2012-13	2011-12	2010-11	Assessment
FRC	14.13	15.22	4.35	65.95
FPPC	1.1	1.1	2.2	6.23

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.
Two week ISTE sponsored workshop on "Engineering Thermodynamics by Dr. V. R. Kalamkar	IIT, Bombay – Main host	organised	11th – 21st December 2012	Prof. U. N. Gaitonde	Engg. Faculty	Personal level
Current Status and Future Directions in the Fuel Cell Research by Dr. S.B. Thombre	M/S Anand Sainergy Fuel Cells (Ind) Pvt. Ltd., Chennai	organised	03 Dec 2012	Dr. G. Velaywthan	PG students + Faculty	Personal level
Zero Defect casting by Dr.A.M.Kuthe	IIT, Bombay	organised	15 Oct. 2011	Prof. Ravi	From industry & Faculty	Personal level
Thermodynamics in Mechanical Engineering by P. D. Sawarkar	IIT, Bombay – Main host	organised	2 Weeks (June 14 – 24, 2011)	Prof. U. N. Gaitonde	Engg. Faculty	Personal level
Heat Transfer by P. D. Sawarkar	IIT, Bombay – Main host	organised	2 Weeks (Nov. 29 – Dec. 10, 2011)	Prof. U. N. Gaitonde	Engg. Faculty	Personal level
Fundamentals of Finite Element Analysis and its Applications using ANSYS (TEQIP – II), 24-26 May, 2013.	-	organised	24-26 May, 2013		PG students + Faculty	Personal level

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:

Department has excellent infrastructure to carry out state of the art research. The major facilities used for the doctoral research include :

- Servo Hydraulic loading Machine : Dr. P. M. Padole
- Rapid Prototyping Machine –CATALYST : Dr. A. M. Kuthe
- NC Machine Tools : Dr. Y. M. Puri
- CNC Co-ordinate Measuring Machine : Dr. Y. M. Puri
- VerticalMillingCenter (VMC) : Dr. Y. M. Puri
- IRB 120 Robot : Dr. S. S. Chiddarwar
- FMS Sim Systems : Dr. S. S. Chiddarwar
- Softwares like ANSYS, Solid Edge V-20, Auto Cast, MCOSMOS, and MIMICS for bio-medical Engineering etc.
- Electronic load agilent make 3300A : Dr. S. B. Thombre

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

The Department was accredited in 2009 for 3 years wef 10/02/2009. The details of improvements are as given below;

Specify the strength / weakness	Improvement brought in	Contributed by	List of PO(s), which are strengthened	Comments, if any
S2012-13	Vibration Exciter, Vibration Measuring facility & FFT analyzer	Dr. A. Chatterjee	b, d, j	NA
	Solar PV Kits	Dr. S. B. Thombre	b, d, j	NA
	Procurement of Servo Hydraulic Machine	Dr. P. M. Padole	b, d, j	NA
	NC Machine Tool	Dr. Y. M. Puri	b, d, j	NA
	Ansys/ MATLAB Software	Head of Department	a, b, c, d, e, j	NA
	Participation by students in National level Competition is allowed with financial support	Dr. H. P. Jawale	a,c,d,h,i,j	NA
2011-12	Participation by students in National level Competition is allowed with financial support	Dr. H. P. Jawale Dr. A. S. Dhoble	a,c,d,h,i,j	NA
	Bio-Mechanics Composite Material	Dr. R. V. Uddanwadikar Dr. A. Chatterjee		
2010-11	Participation by students in National level Competition is allowed with financial support	Dr. A. S. Dhoble	a,c,d,h,i,j	NA
	EDM Machine	Dr. Y. M. Puri	b, d, j	NA
	Auto Cast software	Dr. A. M. Kuthe	b, d, j	

Declaration

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

This Self-Assessment Report (SAR) is prepared for the current academic year (2013-2014) and the current financial year (2013-2014)on behalf of the institution.
I certify that the information provided in this SAR is extracted from the records and to the best of my knowledge, is correct and complete.
I understand that any false statement/information of consequence may lead to rejection of the application for the accreditation for a period of two or more years. I also understand that the National Board of Accreditation (NBA) or its sub-committees will have the right to decide on the basis of the submitted SAR whether the institution should be considered for an accreditation visit.
If the information provided in the SAR is found to be wrong during the visit or subsequent to grant of accreditation, the NBA has right to withdraw the grant of accreditation and no accreditation will be allowed for a period of next two years or more and the fee will be forfeited.
I undertake that the institution shall co-operate the visiting accreditation team, shall provide all desired information during the visit and arrange for the meeting as required for accreditation as per the NBA's provision.
I undertake that, the institution is well aware about the provisions in the NBA's accreditation manual concerned for this application, rules, regulations and notifications in force as on date and the institute shall fully abide to them.

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

Place:Nagpur
Date:

ANNEXURE – I
PROGRAMME CURRICULUM

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: MEC 101	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Engineering Drawing**			
Course Coordinator	**A. A. Thakre**			
Course Objectives :	• To impart and inculcate proper understanding of the theory of projection. • To improve the visualization skills, • To enable the students with various concepts like dimensioning, conventions and standards related to working drawings in order to become professionally efficient, • To impart the knowledge on understanding and drawing of simple residential / office buildings.			
POs	a, b, c, d, i, j.			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	NIL			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title	Elementary Engineering Drawing (Plane and Solid Geometry)		
	Author	Bhatt N.D and Panchal VM		
	Publisher	Charotar Publishing House.		
	Edition	43rd Edition		
2.	Title	Engineering Drawing with An introduction to Autocad		
	Author	Jolhe Dhananjay		
	Publisher	Tata McGraw Hill Publishing Company Limited		
	Edition	1st Edition - 2008		
3.	Title	Handbook BIS SP-46 -1988		
	Author	BIS – SP-46 1988		
	Publisher	BIS		
Content	Introduction to BIS SP-46 -1988, Use of various drawing instruments, Concept of scales, Representative Factor and dimensioning, Conversion of Pictorial views to orthographic/ profile views. Orthographic projections of points, lines, planes ON principle planes/ Profile planes/ Auxiliary planes. Projection of right regular solids inclined to both the planes. Projection of right regular solids inclined to both the planes. Section and development of surfaces of solids. (Preferably in normal position/ Inclined to one plane).Intersections of combination of regular solids (Preferably in normal position/ Inclined to one plane).Drawing isometric views from orthographic projection orthographic views			
Course Assessmen	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%			

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: MEP 101	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Engineering Drawing**			
Course Coordinator	**A. A. Thakre**			
Course Objectives :	To impart and inculcate proper understanding of the theory of projection, To improve the visualization skills, To enable the students with various concepts like dimensioning, conventions and standards related to working drawings in order to become professionally efficient, To impart the knowledge on understanding and drawing of simple residential / office buildings.			
POs	a, b, c, d, i, j.			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	NIL			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title	Elementary Engineering Drawing (Plane and Solid Geometry)		
	Author	Bhatt N.D and Panchal VM		
	Publisher	Charotar Publishing House.		
	Edition	43rd Edition		
2.	Title	Engineering Drawing with An introduction to Autocad		
	Author	Jolhe Dhananjay		
	Publisher	Tata McGraw Hill Publishing Company Limited		
	Edition	1st Edition - 2008		
3.	Title	Handbook BIS SP-46 -1988		
	Author	BIS – SP-46 1988		
	Publisher	BIS		

Content	Introduction to BIS SP-46 -1988, Explanation of various drawing instruments, symbols, RF, dimensioning, etc. Practice of scales, Representative Factor and dimensioning on some practical exemplary figures. Conversion of Pictorial views to orthographic/ profile views Projections of points and lines Projections of planes Projections of lines and planes using Auxiliary planes REVIEW- I of sheets Projections of solids Section and development of solids Intersection of solids Isometric views REVIEW- II of sheets
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL201**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	THEORY OF MACHINES – I			
Course Coordinator	**R. V. Uddanwadikar**			
Course Objectives :	To understand the theory and fundamentals of working of machines to understand different types of assemblies and linkages used in machine parts.			
POs	a, b, c, d, e, h, i, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	NIL			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Theory of Mechanisms & Machines
	Author	Shigley J.E., Uiker J.J
	Publisher	McGraw Hill Int.
	Edition	1985
2.	Title	Theory of Mechanisms & Machinesrs
	Author	Thomos Beven
	Publisher	CBS Publisher
3.	Title	Mechanisms & Machines Theory, ,
	Author	Rao J.S., Dukki Patti R.V
	Publisher	New age Int
	Edition	2nd 1998
4.	Title	Theory of Mechanisms & Machines, Ed;
	Author	Ghosh A, Mallik A
	Publisher	Aff. East-West Press
	Edition	3rd 1998.
5.	Title	Theory of Machine
	Author	Rattan
	Publisher	Tata McGraw Hill
	Edition	1995
6.	Title	Theory of Machines
	Author	Sandor G.N., Erdman A.G
	Publisher	Prentice Hall Publications
	Edition	1984

Content

Basic Concept of Mechanism : Basic concept of mechanisms, links, kinematic pairs, kinematic chain, mechanisms, machine, Types of mechanisms, Degree of freedom of link and planer mechanism, Classification of four-bar chain (Class I and Class II) Inversion of four bar chain, Slider crank chain and double slider crank chain.

Analysis and Synthesis of Mechanism : Velocity, acceleration analysis of planer mechanism by graphical method using relative velocity/ acceleration. Concept of velocity and acceleration image, Coriollis component of acceleration, Instantaneous centre of velocity method. Synthesis of four-bar/ slider crank mechanism for gross motion. Input/ Output coordination and quick return ratio. Transmission angle.

Cam Mechanisms : Types of cams, follower and applications. Synthesis of cam for different types of follower motion like constant velocity, parabolic SHM, cycloidal etc. Construction of eccentric cam, tangent cam and circular arc cam. Analysis of follower motion for cams with specified contours like eccentric cam, tangent cam and circular arc cam.

	Transmission : Belt Drive: Ratio of belt tension, initial tension for flat and V belts. Power Screw: Theory of Friction, Efficiency and torque required to raise and lower load Brakes: Types of brakes and braking torque relations Clutches: Types of clutches and relations for torque transmitted Gears : Types of gears, Gear tooth terminologies. Concept of conjugate action, law of conjugate action, kinematics of involute gear tooth pairs during the contact, number of pairs of teeth in contact, path of approach and path of recess Interference, undercutting for involute profile teeth. Introduction to cycloidal profile. Types of gear trains. Kinematic analysis of ear trains including simple epicyclic and double epicyclic gear trains. Force Analysis : Static force analysis: free body diagram, condition of equilibrium. Analysis of all links of given linkages, cams, gears mechanism and their combinations without friction. Force analysis of four bar chain with friction, Force analysis of gear trains. Concept of inertial load. Dynamic force analysis of four link mechanisms. Dynamic force analysis of cam follower mechanism.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL203**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	Y	
Type of course				
Course Title	**ENGINEERING THERMODYNAMICS**			
Course Coordinator	**S. V. Bopshettty**			
Course Objectives :	• Concept of various forms of energy specially (heat and work) • First and second law of Thermodynamics. • Understanding of various systems / processes for ideal gas / two phase mixtures. • Related Thermodynamic cycles for various applications.			
POs	a, b, c, d, e, f, g, h, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**3**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Engineering Thermodynamics
	Author	Nag P.K
	Publisher	3rd
	Edition	Tata McGraw- Hill, 2002
2.	Title	Engineering Thermodynamics,
	Author	Reyner Joel
	Publisher	5th
	Edition	Addison Wesley, 1999
2.	Title	Thermodynamics;,
	Author	Arora C.P
	Publisher	Tata McGraw Hill Publication
2.	Title	A data book on Thermal Engineering, Ed, , 2003
	Author	Thombre S.B.;
	Publisher	Green Brains Publication
	Edition	1st

Content

Basic Concepts

Introduction to Thermodynamics Basic concept of thermodynamics, Closed and open systems, Forms of energy, Properties of system, State and equilibrium, processes and cycles, Temperatures and Zeroth law of thermodynamics. Introduction to First law of Thermodynamics (Law of conservation of Energy), Heat and work, Mechanical forms of work, non-mechanical forms of work (Electrical, Magnetic etc.) ,Ideal gas equation of states, Difference between Gas and vapor, compressibility Factor, Internal energy and specific heats of gases, Universal Gas constant.

First Law of Thermodynamics
First Law of thermodynamics, Closed system (control mass system), work done, change in Internal energy, heat transferred during various thermodynamic processes, P-V diagrams. Open system (control mass system), Thermodynamic analysis of control volume Conservation of energy principle, flow work and enthalpy The steady flow process applied to (i) Nozzles and Diffuser (ii) Turbines and Compressor, (iii) Throttle valve Unsteady flow process (Simple system like Charging & Discharging of tanks)

Second Law of Thermodynamics
Second law of Thermodynamics Introduction (Law of degradation of Energy) Thermal Energy reservoir, Kelvin-Plank & Clausius Statement, Heat engine, Refrigerator and Heat pump, Perpetual motion machines, Reversible and Irreversible processes, Carnot cycle, Thermodynamic temperature scale. Entropy: The Clausius inequality, Entropy Principle of increase of entropy, Change in entropy for Closed and steady flow open systems.Second law analysis of engineering system, Availability, reversible work and Irreversibility.

	Properties of Steam Critical state, sensible heat, Latent heat, Super Heat, Wet Steam, Dryness fraction, Internal energy of steam External work dine during evaporation, T-S diagram Mollier Chart. Work and heat transfer during various thermodynamic processes with steam as working fluid Determination of dryness fraction using various calorimeters. Air Standard Cycle Air standard cycle: Otto cycle Sterling and Ericsson cycle, Brayton cycle Vapor cycle: Simple and Modified Rankine cycle with reheat & regeneration. I.C. Engines and Compressors Introduction to Internal combustion engine eg.Two stroke, Four stroke cycle, engine components, their comparison,Wankel engine, and their efficiencies, Introduction to Single stage reciprocating compressor and its efficiencies
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL204**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**ENGINEERING METALLURGY**			
Course Coordinator	**Ajay Likhite**			
Course Objectives :	**Objectives :** Students will be able to understand the fundamentals and do structure property co-relation.			
POs	a, b, c, d, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**3**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Introduction to Physical Metallurgy, Ed;
	Author	Avner;
	Publisher	Tata McGraw Hill, 2001
	Edition	2nd
2.	Title	Physical Metallurgy & Heat Treatment,
	Author	Lakhtin Y.; Engg
	Publisher	Mir Publishers, 1998
	Edition	6th
3.	Title	Metallurgy for Engineers
	Author	Rollason E.C
	Publisher	Edward Arnold publications,
	Edition	1959
4.	Title	Introduction to Engineering Metallurgy
	Author	Grewal B.K
	Publisher	
	Edition	

Content

Classification of materials, Properties and applications of materials crystalline nature of materials, especially microscopic examinations of metals. Alloys and solid solutions, types and their formations, modified Gibb's Phase rule, Lever rule for phase mixtures and their application in system.

Study of equilibrium diagram and invariant reactions, Iron-Iron carbide equilibrium diagram, critical temperatures, microstructure of slowly cooled steels, Estimation of carbon from microstructures, structure property relationship. Classification and application of steels, Effect of alloying elements, Specification of some commonly used steels for Engineering applications (e.g. En. AISI, ASTM, IS etc.) with examples

Classification and application of plain carbon steels. Examples of alloy steels such as high manganese steel, Ball bearing steels, maraging steels, spring steels, etc.

Tool steels-classification, composition, application and commercial heat treatment practice for HSS, secondary hardening. Stainless steels- classification, composition, application and general heat treatment practice for stainless steels.

Heat Treatment and its importance, annealing, Normalizing, Hardening, Quench Cracks, Hardenability test TTT Diagram and its construction and related Heat Treatment Processes such as Austempering, Martempering, patenting etc. Retention of austenite, Effects and elimination of retained austenite, Tempering case/ Surface hardening treatments such as carbonizing, Nitriding, Cyaniding, Carbonitriding. Flame and Induction hardening.

Cast Iron- Classification, White Cast Iron, Gray Cast Iron, Nodular Cast Iron, Malleable Cast Iron, and Chilled and alloy Cast iron. (Production route, Composition, Microstructure and applications)

	Effects of various parameters on structure and properties of Cast Iron, Alloy Cast Iron such as Ni resist Ni hard, Non-Ferrous Alloys: Study of non-ferrous alloys such as brasses (Cu-Zn diagram), bronzes (Cu-Zn diagram), Aluminum alloys (e.g. Al-Si and Al-Cu diagram), bearing materials Tension Test: Engineering and True stress strain curve, conversion relationship, evaluation of properties, numerical based on tension and compression test, Types of engineering stress strain curves, compression test.Hardness test- Brinell, Vickers, And Rockwell. Introduction to Charpy and Izod Impact Test, Introduction to Non Destructive Testing.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 206**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Solid Mechanics**			
Course Coordinator	**H. P. Jawale**			
Course Objectives :	By learning the subject, students will understand the behaviour of Mechanical systems under various loading conditions. This will laid down the fundamentals required for design and analysis of the mechanical components.			
POs	a, i, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title			
	Author			
	Publisher			
	Edition			

Content

Introduction, stress, strain, types of stresses, stress strain diagram, hooke's law, analysis of composite section, thermal stresses and strain, thermal stresses, longitudinal stress and strains, lateral stress and strain, poisons ratio, volumetric stresses and strain with uni-axial, bi-axial and tri-axial loading, bulk modulus, relation between Young's modulus, and modulus of rigidity, poison's ratio and bulk modulus.
Principal stress and strain: - Analytical method, Mohr's circle for representation of stresses, derivation of maximum and minimum principal stresses and maximum shear stresses when member is subjected to different types o stresses simultaneously (i.e. combined stress)

Types of beam (cantilever, simply supported, overhang beam etc.), types of load (concentrated and UDL), shear force and bending moment diagram for different types of beams subjected to different types of loads

Stresses in beam: pure bending, theory of simple bending with assumption and expression for bending stresses, derivation of bending equation, bending stresses in symmetrical sections, section modulus for various shapes of beam sections.

Shear stresses in beams

Derivation of differential equation of elastic curve with the assumptions made in it, deflection and slopes of cantilever, simply supported, overhang beams subjected to concentrated load, UDL, relation between slope deflection and radius of curvature, Macaulay's method, Area-Moment method to determine deflection of beam.

Derivation of torsion equation with the assumptions made in it, torsion shear stress induced in the shaft when it is subjected to torque, strength and rigidity criteria for design of shaft, torque transmitted for solid and hollow circular shaft, derivation of maximum, minimum principal stresses and maximum shear stress induced in shaft when it is subjected to bending moment torque and axial load.
Column and struts: Failure of long and short columns, slenderness ratio, assumptions made in Euler's column theory, end conditions for column, expressions for crippling load for various end conditions of column, effective length of column, limitations of Euler's formula, Johnson's parabolic formula

Definition of strain energy stored in a body when it is subjected to gradually applied load, suddenly applied load sand impact loads, strain energy stored in bending and torsion.
Factor of safety, statistical method of determining factor of safety, theories of failure, modes of failure, Compound stresses, eccentric axial loading, variable stresses in machine parts stress concentration and stress raiser, notch sensitivity, stress concentration factor, methods of reducing stress concentration, Goodman's criteria, soderberg's criteria, Garber's criteria, fatigue design for finite and infinite life of parts subjected to variable loads

	Two problems on principal stresses. Two problems on Mohr's circle. Two problems on thermal stresses with heat flow. Two problems on SF and BM diagram. Two problems on stresses in `beam bending Two problems on shear stresses. Two problems on Macaulay's method. Two problems on Area –Moment method. Two problems on shafts. Two problems on columns and struts. Two problems on compound loading. Two problems on fatigue and variable loads.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP 204**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**ENGINEERING METALLURGY**			
Course Coordinator	**Ajay Likhite**			
Course Objectives :	Students will be able to learn and practice preparation, identification of micro structure and understand basic mechanical tests.			
POs	a, b, c, d, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**0**	**0**	**2**	**02**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Content	A set of 10 Experiments from following list Study of Metallurgical Microscope Preparation of specimen for metallographic examinations Preparation of Mounted sample with the help mounting press/ cold setting resins Study and drawing of microstructures of steels. Study and drawing of microstructures of cast iron. Study and drawing of microstructures of non-ferrous metals. Study of the effect of annealing and normalizing on the properties of steel Determination of hardenability of steels by Jominy End Quench Test. Tensile Test on mild steel and aluminum test specimen. Measurement of Hardness of ferrous and non-ferrous materials with the help of Brinell Vickers Rockwell Testing machine Study the heat treatment of High Speed Steels Study the heat treatment of Stainless Steels Study of effect of Alloying element on Properties of Steels Study of Macroscopic examination Study of Mechanisms of Quenching Study of Pack carburizing of steel samples Impact Test.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MAL201**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Integral Transform & PDE**			
Course Coordinator	**G. P. Singh**			
Course Objectives :	• Graduates will be able to apply knowledge of mathematics, science and engineering in the solution of Mechanical Engineering problems. • Graduates will demonstrate an ability to identify, formulate, analyze and solve Mechanical Engineering problems. • Graduates will demonstrate ability to design mechanical systems, conduct experiments, analyze and interpret the resulting data. • Graduates will demonstrate an ability to design a system, component to meet desired needs within the context of Mechanical Engineering and considering realistic constraints.			
POs	a, b, c, d, e, h, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**3**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Advanced Mathematics For Engineers and Scientists
	Author	M.R.Speigel
	Publisher	McGraw Hill
	Edition	1992
2.	Title	Mathematics for Engineers, Ed;,.
	Author	Chandrika Prasad
	Publisher	Prasad Mudranalaya
	Edition	12^{th} 1981
2.	Title	Advanced Engineering Mathematics; Ed;
	Author	Kreyszig E
	Publisher	John Wiley & Sons
	Edition	7^{th} 1993
2.	Title	Advanced Mathematics for Engineers, Ed;,
	Author	Chandrika Prasad
	Publisher	Prasad Mudra
	Edition	9^{th}1972.

Content

Differential Equation

Solution of Ordinary differential equation of higher order, Frobenius method, Legendre equation, Bessel equation, Legendre Polynomials, Bessel function of first and second kind.

Laplace Transform

Definition & its properties, transform of derivatives and integrals, evaluation of integrals by Laplace Transform. Inverse Laplace Transform, convolution theorem, Laplace transform of periodic function and unit step function and dirac delta function, application of Laplace transform to solve ordinary differential equation and partial differential equation-One-dimensional wave and heat equation

Partial Differential Equation

Partial differential equation of first order. Linear homogeneous partial differential equation of nth order with constant coefficient, Method of separation of variables, application to simple problem of vibration of strings and beam, to simple of vibration of rectangular membrane and one dimensional heat equation.

Fourier Series

Introduction, the Fourier theorem, Evaluation of Fourier coefficients, Half Range series, considerations of symmetry, Exponential form of Fourier series, Fourier integral theorem, Fourier transform, Elementary concept of double Fourier

	Series. Complex Variable Analytical function, Cauchy-Riemann conditions, conjugate functions, singularities, Couchy's integral theorem and integral formula, Taylor's and Laurent's theorem, Residue theorem, Evolution of integral by residue theorem, Conformal mapping, mapping by Linear and Inverse transformation.
Course Assessment	Sessional – II : 15%, Sessional – III : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL202**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**FLUID MECHANICS**			
Course Coordinator	**A. S. Dhoble**			
Course Objectives :	• To understand the basic concepts regarding the behaviour of fluid. • To learn various methods for estimation of forces due to fluid / fluid pressure measurement and flow measurements. • Develops skill to analyze various fluid systems.			
POs	a, b, d, h, k			

Semester	Odd: No		Even: **Yes**	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**3**	**0**	**0**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Fluid mechanics; Ed
	Author	White F.M
	Publisher	McGraw Hil
	Edition	2nd1986
2.	Title	Mechanics of fluids
	Author	Massey B.S
	Publisher	ELBS-Chapman & Hall
	Edition	6th Ed1994
3.	Title	Fluid mechanics, 7th Ed;,
	Author	Streeter V.L, Wylie E.B
	Publisher	McGraw Hill
	Edition	1983
4.	Title	A data book on Thermal Engineering
	Author	Thombre S.B.
	Publisher	Green Brains Publication
	Edition	1st 2003

Content

Introduction
Properties of fluids, viscosity, capillarity and surface tension, Fluid pressure and its measurement
Pressure variation in compressible and incompressible fluids, Hydrostatics: Forces on plane and curved surfaces, Buoyancy, Stability of floating and submerged bodies, Relative equilibrium pressure distribution in liquid subjected to acceleration and rotation.

Flow Kinematics
Types of flows; steady and unsteady, rotational and irrotational, laminar and turbulent, etc
Streamlines, potential lines, flow net, vortex motion, Velocity and acceleration at a point, stream function, potential function, continuity equation, Bernoulli's equation and its applications.

Measurement of Fluid Flow
Through ducts: Orifice meter, venturi meter, rotameter, etc., Through open channels: Triangular notch, Rectangular notch, trapezoidal notch, etc., Through reservoirs: Orifice, mouthpiece, etc.

Viscous Flow
Through pipes and parallel plates (Hagen poiseuille and plane poiseuille flow)
Boundary layer concept, boundary layer thickness, wall shear, displacement thickness, momentum thickness and energy thickness, integral equation,Boundary layer separation.

Flow Through Pipes
Major and minor losses, friction chart, Pipes in series and parallel, Siphon, Power transmission
Hydraulic Gradient Line and Total Energy Line

Compressible Flows
Introduction to compressible flows, speed of sound wave, Mach number, Mach cone, one dimensional isentropic flows, stagnation properties, flow through nozzles, normal shock

Tutorials: (minimum 5)

	Dimensional analysis and similitude, Error analysis, Drag and lift on immersed bodies, Kinetic energy and momentum correction factors, Water hammer, Pipe networks, Other assignments based on the theory syllabus
Course Assessment	Sessional – II : 15%, Sessional – III : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: MEL207	**Open course (Y/N)**	**HM Course (Y/N)**	**DC (Y / N)**	**DE (Y / N)**
	N	N	N	
Type of course				
Course Title	**MANUFACTURING PROCESSES-I**			
Course Coordinator	**R. V. Uddanwadikar**			
Course Objectives :	**Objectives :** • To understand different manufacturing process and select the best one out of the available methods. • To understand the design for manufacturability.			
POs	a, b, c, d, e, f, g, h, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Manufacturing Technology: Metal cutting & Machine Tools
	Author	Rao P.N
	Publisher	
	Edition	
2.	Title	Manufacturing Science
	Author	Ghosh, Malik
	Publisher	Affiliated East-West Press Ltd, Anand
	Edition	2001
3.	Title	Workshop Technology
	Author	Hajra Choudhari
	Publisher	Media Promoters & Publishers
	Edition	13th
4.	Title	Manufacturing Engg & Technology, Ed;,
	Author	Kalpakjian S, Schmid SR
	Publisher	Pearson Edu Asia
	Edition	4th 2000
5.	Title	Technology of machine Tools
	Author	Krar, Oswald
	Publisher	McGraw Hill New York
	Edition	1976
6.	Title	Manufacturing Processes;
	Author	Begman M
	Publisher	Texas,
	Edition	1956
7.	Title	Production Technology;,
	Author	--
	Publisher	HMT New Delhi
	Edition	1981
8.	Title	Workshop Technology
	Author	Bawa H. S
	Publisher	Tata McGraw Hill
	Edition	2001

Content	Pattern Making : Casting Processes, Pattern making, pattern materials, Types of pattern, Removable and disposable pattern, pattern allowances, color codes of pattern. Moulding Sands: Types of Moulding sands, properties of moulding sand. Moulding: Types of Moulds, Tools used in moulding, Procedure for making moulds, Moulding process, Types of moulding operations. Cores: Properties of cores, types of cores, core making, chaplets Casting :

	Elements of gating system, Types of gating, risering, Melting and pouring of metals,Melting Furnaces: Electric arc furnace, Cupola furnace, Induction furnace, oil fired tilting furnace. Defects in sand casting: blowholes, shrinkage defect, hot tears. Mis-runs, cold shut, and pour short, Inclusions. Special casting processes: Plaster mould casting processes, shell moulding casting processes, permanent mould casting processes, die casting processes, continues casting processes, centrifugal casting processes, Advantages and limitations of casting processes, selection of casting process. CO2 moulding, Investment casting. Mechanical Working of Metals : Mechanical working of metals: Hot rolling, hot spinning, wire drawing. Metal Forming Process: Rolling Processes, rolling operation, terminology used in rolling, rolling mills, thread rolling, Extrusion Process: Types of extrusion, extrusion pressure in direct and indirect extrusion. Forging Processes: Forging materials, classification of forging operations, types of forging operations. Power forging, Impression die forging, press forging, roll-die forging, and defects in forging, Rotary swaging. Defects in forging. Surface Coating of Metals: Cleaning methods of metals, buffing, and electroplating, anodizing, plastic coating. Sheet Metal Working : Introduction, Punches and dies, sheet metal working operations: piercing and punching, blanking, notching, beading, flanging, hemming, seaming, perforating, slitting, lancing, mechanism of blanking, drawing, coining, embossing, wire drawing, metal spinning. Powder Metallurgy and Processing of Plastics : Introduction, Methods of manufacturing powders, production of metal powder, mixing of powders, compaction, sintering, secondary operation, advantages and limitation of powder metallurgy. Processing of Plastic: Introduction, general properties and applications, types of plastic, thermosetting plastic, thermo-plastic plastics. Forms of raw plastic material: Powder form, laminated sheets and rods, fibers, resins, Methods of processing plastics: compression molding, injection molding, extrusion, Calendaring, wire drawing. Welding : Metal joining processes: Introduction, classification of joining processes. Welding process: Types of welding processes, pre-welding requirements, and welding, welding technique, types of welding joints, edge preparation for welding, welding techniques. Arc welding: electron theory of arc columns, arc-welding process, weld penetration, Gas welding: Gas welding process, Types of flames, fluxes, filler material. Resistance Welding: Spot welding, seam welding, tungsten inert gas (TIG) welding, Metal Inert gas welding (MIG). Soldering and brazing, Thermit welding. Mechanical Fasteners: Threaded fasteners, non-threaded fasteners.
Course Assessment	Sessional – II : 15%, Sessional – III : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP207**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**MANUFACTURING PROCESSES – I LAB**			
Course Coordinator	**R. V. Uddanwadikar**			
Course Objectives :	**Objectives :** • To understand different manufacturing process and select the best one out of the available methods. • To understand the design for manufacturability			
POs	a, b, c, d, e, f, g, h,j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Content	Pattern Making Shop: 1. Study of various joints used in pattern making.			

	2. Study of different wood working machines. 3. Study of various tools used in pattern making. 4. Study of various pattern allowances. 5. Practice of making a pattern. Foundry Shop: 1. Study of different furnaces (i.e. Cupola, Electric arc, Induction, Tilting etc.) 2. Study of different types of pattern. 3. Study of different types of Foundry tools. 4. Study of different types of sands and their properties. 5. Practice of making green sand mould. Welding Shop: 1. Electric Arc Welding. 2. Resistance welding 3. Gas welding 4. Gas cutting Sheet Metal Working
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 301**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**THEORY OF MACHINES-II**			
Course Coordinator	**A. B. Andhare**			
Course Objectives :	The course aims to make the students competent for analysis of dynamic forces and vibration in mechanical systems. The students are expected to be competent to do the following : Analyze dynamic forces in reciprocating engine, mechanisms and other planer mechanisms. Design flywheel, Represent mechanical systems in terms of mathematical model for vibration analysis, Find natural frequency of single degree freedom systems Analyse free and forced vibration Understand the principle of Gyroscope and its applications.			
POs	a, b, c, e, f, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Theory of Mechanism and Machine
	Author	Ghosh & Malik
	Publisher	Aff. East-West Press, Anand
	Edition	3rd
2.	Title	Theory of Machine,;
	Author	Ratan;
	Publisher	Tata McGraw Hill, New Delhi
	Edition	12th Reprint Edition
3.	Title	Theory and Practice of Mechanical Vibration,;
	Author	Rao,Gupta
	Publisher	New Age International
	Edition	2nd Ed
4.	Title	Elements of Vibration Analysis,;
	Author	Meirovitch L
	Publisher	McGraw Hill Publications
	Edition	2nd Ed

Content	Machine Dynamics Concepts in machine element dynamics. D'Alembert principle and inertia forces. Unbalance forces and moments in rotor-disc assembly. Static and dynamic balancing by analytical as well as graphical method. Field balancing by vector diagram and by influence coefficient method. Balancing of reciprocating masses Dynamic force analysis of reciprocating mechanism by analytical method. Primary and secondary inertia forces. Balancing of inertia forces in reciprocating mechanism. T-ϛdiagram for single-cylinder and multi-cylinder engines and other reciprocating machines such as punching press. Selection of Flywheel inertia parameters. Balancing of inertia forces and couples in multi-cylinder engines. Selection of firing order and crank diagram. Radial engines and V-twin engines. Gyroscopic effect in machines such as ship, vehicles, grinding mills. Vibration Basic methods of mathematical modeling of discrete vibratory systems. Free body diagram, Rayleigh energy method and Langrange equation. Laplace transform and transfer function derivation. Free vibration of single DOF systems. Estimation of Damping. Forced vibration under harmonic excitation. Impulse and step response. Modeling of two DOF systems. Torsional vibrations of rotors. Whirling of shaft and critical speed. Modeling of multi-degree of freedom system mode orthogonality property. Natural frequency and mode shape calculation by matrix iteration method. Modal analysis. Free and forced vibration.
Course	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10%

Assessment	End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP301**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**THEORY OF MACHINES-II LAB.**			
Course Coordinator	**A. B. Andhare**			
Course Objectives :	**Objectives :** To understand the theory and fundamentals of working of machines To understand different types of assemblies and linkages used in machine parts.			
POs	a, b, c, e, f, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Content	• Determination of jump-of speed of a typical cam-follower system. • Dynamic balancing of rotating masses. • Balancing of reciprocating mechanism. • Critical speed of shafts. • Gyroscope • Free vibration of single DOF and two DOF spring mass system. • Natural frequency determination of cantilever beam. • Damping determination through free vibration logarithmic decay of simple damped system. • Natural frequency determination of two & three rotor system. • Torsional vibration of bifilar or trifilar pendulum. • Transmissibility of single DOF system. • Dynamic vibration absorber. • Dynamic force analysis of four bar mechanisms. • Dynamic force analysis of slider crank mechanism. • Flywheel selection and parameter design for a typical multi cylinder engine. • Performance characteristics of governors.
Course Assessment	Sessional – II : 15%, Sessional – III : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: MEL303	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	Y	
Type of course				
Course Title	**ENERGY CONVERSION- I**			
Course Coordinator	**S. V. Bopshetty**			
Course Objectives :	Basically uses all the applications of steam & its measurements leading to Thermal Power Plant using any fuel.			
POs	a, b, c, d, e, g, h, i, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books		
1.	Title	Thermal Engineering
	Author	Domkundwar, K'raman, Khajuria
	Publisher	Dhanpatrai & sons
	Edition	4th1996
2.	Title	Thermal Engineering,
	Author	Ballaney P.L
	Publisher	Khanna Publishers
	Edition	24th2003
3.	Title	Engineering Thermo: Work and Heat Transfer;
	Author	Rogers, Mayhew
	Publisher	Longman, London
	Edition	1992
4.	Title	Steam Turbines;
	Author	Kearton V.J
	Publisher	The English Language Book Society, London,
	Edition	1961
5.	Title	A data book on Thermal Engineering
	Author	Thombre S.B
	Publisher	Green Brains Publication
	Edition	1st2003

Content

Steam Generators

Principles of steam generation, Classification of Steam Generators, Fire tubes and Water tubes Steam Generators, High Pressure and Super critical Steam Generators, Boiler Mountings and Accessories.

Draught

Draught and its classification, Chimney height, Chimney Efficiency, Condition for maximum discharge. Performance of Steam Generators, Evaporative Capacity, Equivalent Evaporation, Factor of Evaporation, Boiler Efficiency, Energy balance.

Fluidized Bed Boilers

Fluidized Bed Boilers: Bubbling Fluidized Bed Boiler, Circulating Fluidized Bed Boiler, Introduction to Cogeneration and Combined Cycles, Power Plants.

Steam Nozzles & Steam Turbines

Steam Nozzles: Adiabatic expansion in nozzles, Maximum Discharge, Critical Pressure Ratio and effects of Friction, Calculation of throats and exit area, Super Saturated flow, Wilson's line.

Steam Turbines: Principles of Working of Steam Turbines, Classifications of Steam Turbine, Comparison of Impulse and Reaction Turbines, Simple and Compound Steam Turbines.

Steam Turbines and Engines

Energy losses in Steam Turbines, Flow of steam through Turbine blading, Actual Reheat factor, Velocity diagrams, Graphical and analytical Methods, Work done, Thrust and Power, Dimensions and Proportioning of the Blades, Steam Turbine, Efficiencies, Condition for Maximum Efficiency, Reheat and Regenerative cycles, Governing of Steam Turbine. Introduction to Simple Steam Engine. Modified Rankine Cycle.

Steam Condensers and Cooling Towers

	Steam Condensers and Cooling Towers: Types of Condensers, Classification of Condenser, Quantity of cooling water Required, Design Calculations for Surface Condenser, Daltons Law of Partial Pressures, Sources of Air Leakage and Air Removal. Wet and Dry Pumps, Air Ejectors, Cooling Towers, Cooling Ponds. **Tutorials:** High pressure boilers, Meta-stable flow in steam nozzles, Governing of steam turbines, Blade design in steam turbines, Cooling Towers and cooling ponds, Design aspects of steam condenser.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA

Department: Mechanical Engineering

Course No: **MEL304**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**MACHINE DESIGN-I**			
Course Coordinator	**M. S. Kotambkar**			
Course Objectives :	To apply knowledge of mechanics of materials for designing mechanical elements including design process, failure prevention under static & variable loadings.			
POs	a, b, c, e, f, g, h, i, j, k			

Semester	Odd: No		Even: Yes	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**2**	**02**	**08**
Prerequisite course codes as per proposed course numbers	MEL 206			
Prerequisite credits	08			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Mechanical Design of Machine
	Author	Maleev V.L, Hartman J.B
	Publisher	CBS Pub. & distributors
	Edition	1983
2.	Title	Machine Design
	Author	Black P.H., Adams O.E
	Publisher	Tata Mc Graw Hill
	Edition	1968
3.	Title	Mechanical Engg. Design
	Author	Shigley J.E
	Publisher	Tata Mc Graw Hill International
	Edition	8th
4.	Title	Design of Machine Elements, Ed;,
	Author	Shiwalkar B.D.;
	Publisher	Central Techno Publication
	Edition	2nd 2001
5.	Title	Design Data for Machine Elements;,
	Author	Shiwalkar B.D
	Publisher	Central Techno Publication Nagpur
6.	Title	Design data
	Author	PSG College of Technology
	Publisher	DPV Printers, Coimbature
	Edition	2011
7.	Title	Design of Machine Elements
	Author	V. B. Bhandari
	Publisher	Tata McGraw Hills
	Edition	3rd, 2013

Content

Design Principles

Definition of design, types of design, design process, need, defining the problem, feasibility, preliminary design alternatives, final design selection, preliminary and final plans and drawings.

Failure criterion & manufacturing considerations in design, basis of good design, theories of failure and factor of safety, wear, corrosion, manufacturing methods, machining tolerance, surface finish, cost design consideration in casting & forging. Material Selection: Mechanical properties, Applications and designations as per ISI and their equivalence with other standards of engineering materials, selection of material, temperature effects on material properties of ferrous and non-ferrous materials, plastics, composites & their applications.

Joints

Design of Joints :

Design of cotter and knuckle joint, shrink and press fit joints. Riveted Joint: Riveted joints for boilers, structural works (uniform strength joint), and eccentric loaded joint. Welded Joint: Design of single

	transverse, double transverse, parallel fillet, combination fillets butt joint, eccentrically loaded welded joints. Bolted Joint: Design of bolted fasteners, bolts of uniform strength, bolted joints under eccentric loading. Design of lever and pin joints: Hand lever, Foot lever, and Bell Crank lever. Design of Springs Design of Power screws : Forms of threads; square, Acme & Trapezoidal threads, efficiency of various threads form. Design of screw jack and compounded screws. Design of Springs, Expression for deflection and shear stress in helical spring, design of helical spring, design of leaf spring. Design of brakes & clutches Kinematics of friction drives such as brakes, clutches design of friction clutch, single plate, double plate, cone, centrifugal clutch, design of brake, shoe brake, band brake, internal expanding brake. Design of pressure vessels Classification of thin & thick cylindrical pressure vessel, stresses in thin & thick cylindrical pressure vessel when it is subjected to internal pressure, expression for circumferential & longitudinal stresses, designs of pressure vessel, heads & cover plate. Design of shafts: Design of Transmission shafts on the basis of strength, rigidity & critical speed, ASME code for shaft design. Design of stepped shaft, axle, splined- shaft, keys.
Course Assessment	Sessional – I : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP304**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Design Lab.**			
Course Coordinator	**A. K. Singh**			
Course Objectives :	• To understand the basics of machine design • To apply gained knowledge for solving real life problems related with Design of Machine components.			
POs	a, b, c, d, e, h, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Content	Practicals based on syllabus.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA

Department: Mechanical Engineering

Course No:	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**MEP202 : FLUID MECHANICS LAB.**			
Course Coordinator	**A. S. Dhoble**			
Course Objectives :	**Objectives :** • To understand the basic concepts regarding the behaviour of fluid. • To learn various methods for estimation of forces due to fluid / fluid pressure measurement and flow measurements. • Develops skill to analyze various fluid systems.			
POs	a, b, c, d, e,h, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Content	1. Determination of viscosity of a fluid by falling sphere method 2. Study of manometers 3. Study of pressure variation along the depth in an incompressible fluid 4. Study of vortex motion 5. Determination of metacentric height of a ship model 6. Tracing of stream lines 7. Verification of Bernoulli's equation 8. Determination of drag and lift coefficients 9. Determination of coefficient of discharge of a venturi/ orifice meter 10. Determination of coefficient of discharge of an orifice/ mouthpiece 11. Determination of coefficient of discharge of different notches 12. Study of Hagen Poiseuille flow 13. Reynolds experiment 14. Other experiments based on the theory syllabus
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA

Department: Mechanical Engineering

Course No: **MEL 302**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**HEAT TRANSFER**			
Course Coordinator	**S. B. Thombre**			
Course Objectives :	To introduce students different modes of heat transfer like conduction, convection & Radiation, Estimation of heat transfer through composite walls & transient temperature state HT to sudden change Prediction of hic for different g			
POs	a, b, c, d, e, h, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books		
1.	Title	Funda.of Heat & Mass Transfer
	Author	Incropera FP, Dewitt D P
	Publisher	John Wiley & Sons
	Edition	4th1996
2.	Title	Heat Transfer; Ed;,
	Author	Holman J. P.;
	Publisher	McGraw Hill
	Edition	8th 2003
3.	Title	A Textbook on Heat Transfer
	Author	Sukhatme S. P
	Publisher	Orient Longman Ltd Bombay
	Edition	1985
4.	Title	A data book on Thermal Engg, Ed;,
	Author	Thombre SB
	Publisher	Green Brains Publication
	Edition	1st2003

Content

Basic modes of Heat Transfer & their mechanisms

Introduction, Conduction: Fourier law of heat conduction, Thermal conductivity, General conduction equation, thermal diffusivity, One Dimensional, steady-state, without heat generation heat transfer, Concept of thermal resistance and electrical analogy, Conduction through composite slab/cylinders/spheres, Contact resistance/ Fouling Factor, Overall heat transfer coefficient, Critical thickness of Insulation, Analysis of extended surfaces: Rectangular profile longitudinal fins/ spines, Lumped heat capacitance method of unsteady analysis.

Forced Convection

Flow over flat plate, Hydrodynamic & thermal boundary layer, Prandtl Number, Nusselt Number, Reynolds Number, Local and average heat transfer coefficient, Empirical relations for external flows, Flow through ducts.

Natural Convection

Natural Convection from vertical plate, Grashoff's Number, Empirical relations for natural convection from various bodies.

Condensation

Filmwise and Dropwise condensation, Nusselt theory for filmwise condensation on vertical plates, Pool Boiling Curve.

Radiation

Laws of Radiation, Black body, Grey body & Coloured body, Emissivity, Black body radiation, Shape factor & its properties, Radiation exchange between two gray surfaces.

Heat Exchanger

Classification of heat exchangers, LMTD Approach for parallel & Counter flow heat exchangers,

	NTU approach for parallel/ Counter flow heat exchangers, Design aspects of heat exchangers.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assesment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL305**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**MANUFACTURING PROCESSES- II**			
Course Coordinator	**A. B. Andhare**			
Course Objectives :	**Objectives** : The students will achieve sufficient knowledge & studies to : understand and analyze basic machining operation understand the theory of metal cutting & apply it to various operations, Learn different non conventional machining processes, their features & controlling parameters.			
POs	a, b, c, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Text Book of Production Engineering
	Author	Sharma P.C
	Publisher	S Chand & Co. Ltd. 2002
	Edition	10th
2.	Title	Element of Manufact. Processes,.Ed.; PHI,
	Author	Parashar B.S., Mittal R.K
	Publisher	Eastern Eco
	Edition	2003
3.	Title	Manufacturing Science;
	Author	Ghosh A., Mallik A.K
	Publisher	Affiliated East-West Press Pvt. Ltd.,
	Edition	2001
4.	Title	Modern Machining Processes,
	Author	Pandya, Shah
	Publisher	Tata McGraw Hill, New Delhi,
	Edition	12th 1998
5.	Title	Elements of Workshop Tech. Ed;.
	Author	Hajra Choudhary S.K., Bose S.K, HajraChoudary A.K., Roy H
	Publisher	Media Promoters & Pub
	Edition	Vol.I & II, 19th

Content

Theory of Metal Cutting
Introduction, orthogonal and oblique cutting, mechanics of metal cutting, shear plane stress, strain and cutting forces, cheap formation. Cutting force calculation, determination of torque and power requirement for turning, drilling and milling. Influence of tool angle, cutting fluids, cutting tool materials, cutting speed, feed and depth of cut, effect on power requirement, tool life.

Lathes
Introduction, construction, types, work holding devices, operating conditions, operations on lathe. Turrets, capstan and automats. Introduction, construction, classification, tool attachments of turret and capstan lathe, bar feed mechanism, indexing mechanism. General operation mechanism, classification advantages of automatic lathe machines. Drilling, Shaping, planning, slotting, milling Machines

Drilling: Introduction, operating conditions, material removal rate. Boring, reaming, tapping, shaping, planning and slotting, Introduction, types, operating conditions, machining time, material removal rate. Milling: Introduction, types, milling process, operating conditions, material removal rate, types of milling operations. Indexing, Introduction to Jigs and fixtures, types, applications.

Finishing Processes
Grinding wheel, grinding machines, fine finishing operations such as lapping, honing, polishing

	buffing Non-conventional Machining Processes Introduction, classification, water jet machining, chemical machining, electro chemical machining, electrical discharge machining, non-conventional forming processes.
Course Assessment	Sessional – II : 15%, Sessional – III : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 306**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**MACHINE DRAWING**			
Course Coordinator	**H. P. Jawale**			
Course Objectives :	This course will teach the practice followed for graphical interpretation of mechanical comments designed by design section, so that the actual manufacturing			
POs	a, c, e, f, j			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Machine Drawing,
	Author	Naryana K.L., Kannaiah R., Venkata Reddy K
	Publisher	New Age Int.Pub.
	Edition	1st
2.	Title	Production Drawing
	Author	Naryana K.L., Kannaiah R., Venkata Reddy K
	Publisher	New Age Int.Pub.
	Edition	1st
3.	Title	Machine Drawing; Ed;
	Author	N.D.Bhatt
	Publisher	Charotar Publishing House
	Edition	33RD2000
4.	Title	Design data
	Author	PSG College of Technology
	Publisher	DPV Printers, Coimbature
	Edition	1st Ed.; , 2002
5.	Title	Engg. Drawing practice for schools & colleges
	Publisher	Bureau of Indian Standards
	Edition	1st1998

Content	Drawing Standards for following Drawing Sheets , Name Blocks, Lines, Sections, Dimensioning, Dimensioning of Tolerances Standard Components, Standard Features, Machining Symbols, Welding Symbols, Surface Finish Symbols, Heat Treatment, Manufacturing Instructions, Allowances, Materials. Orthographic Projections of Elements Orthographic Projections, Sectional Views, Multiple Views, Missing Views, Profiles, Cross sections, References, Alignments, Dimensioning. Study, qualitative selection of type / size (excluding design calculations) and standard practices for the following elements Threads, Bolts, Nuts, Washers, Rivets, Welds, Keys & Keyways, Splines, Couplings. Assembly and Dismantling Techniques, Principles of Assembly Fits and Tolerances (Standard, types, application and selection) Tolerance Charting Surface Finish requirement for assembly, Manufacturing Method, Geometrics suitable for assembly, Assembly/Dismantling Tools, Bearing Assemblies, Assemblies by fastening. Assembly Drawings (Principles, techniques and standards of drawing of following) Component, Subassembly, Full assembly, Exploded Views, Various frames / brackets / housings / casings, Study of some standard assemblies. Production Drawing Name Plates, Part List, Revisions, etc., Essential Parts/Formats required for production drawing, Process Sheet
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL308**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**ENERGY CONVERSION –II**			
Course Coordinator	**S. B. Thombre**			
Course Objectives :	• Concept of various forms of energy specially (heat and work) • First and second law of Thermodynamics. • Understanding of various systems / processes for ideal gas / two phase mixtures. • Related Thermodynamic cycles for various applications.			
POs	a, b, c, d, g, h, i, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title	Thermal engineering, Ed;,		
	Author	Ballaney P.L		
	Publisher	Khanna Publishers		
	Edition	24th2003		
2.	Title	IC engines		
	Author	Ganesan V		
	Publisher	Tata Mc Graw Hil		
	Edition	2nd2004		
3.	Title	Refrigeration and air conditioning system		
	Author	Arora C.P		
	Publisher	Tata McGraw Hill		
	Edition	2nd2001		
4.	Title	Steam and Gas Turbines;		
	Author	Yadav R.		
	Publisher	Central Publishing house Allahbad,		
	Edition	2001		
Content	I.C. Engines : Air standard and fuel air cycles, parts of I.C. engines, two stroke and four stroke I.C. engines, SI and CI engines, combustion in SI and CI engines, detonation, carburetion and diesel injection. Measurement of power: indicated, friction and brake power, fuel and air consumption, indicated, brake, volumetric and mechanical efficiency, percentage of excess air, heat balance sheet, performance characteristics & factors influencing the performance of I.C. engines. Gas Turbines & Jet Propulsion : Ideal cycles, small stage efficiency, pressure losses, intercooling, reheat & regeneration, fuel-air ratio, combustion efficiency, performance calculations, open cycle and closed cycle gas turbines. Working of turbojet, turboprop, ramjet & pulsejet, performance. Reciprocating Compressors Parts, operations, work done during isothermal, polytropic & adiabatic compression process, PV diagram, isothermal, volumetric and mechanical efficiency, effect of clearance, multistage compressor, condition for minimum work input, capacity control, actual indicator diagram. Refrigeration And Air Conditioning : Vapor compression refrigeration system, analysis, actual refrigerating cycle, effect of subcooling & superheating, C.O.P., performance calculation, psychometric chart and processes such as heating cooling, humidification & dehumidification.			
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%			

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL417**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**POWER PLANT ENGINEERING**			
Course Coordinator	**A. S. Dhoble**			
Course Objectives :	• To gain the basic knowledge regarding the various power plant system • To understand the various methods of tariffs of energy issue.			
POs	a, c, e, f, h, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Power Station Engineering & Economy
	Author	Stroteki, Vopat
	Publisher	Tata Mc Graw Hill
	Edition	1977
2.	Title	Power Plant Engineering;,
	Author	Domkundawar
	Publisher	Dhanpat Rai & Sons
	Edition	1980
3.	Title	Plant Engineering;,
	Author	Nagpal G. R
	Publisher	Khunna Publications
	Edition	1978
4.	Title	Plant Engineering;,
	Author	ni H. S
	Publisher	rd Book House
	Edition	
5.	Title	Plant Engineering.,,
	Author	Morse Frederick T
	Publisher	.; D Van Nostrand Co
	Edition	3rd Ed 1961
6.	Title	Plant Engineering;.,
	Author	Verma M.
	Publisher	Metropolitan Book Co
	Edition	1987

Content

Steam Power Plant : Reheat-regenerative cycle, binary cycle, topping and superimposed cycle.
Steam generators: Modern generators, once through and fluidized bed boilers design. Consideration of modern steam generators, furnace, fuel firing methods, fuel and ash handling systems, various accessories of steam generators, steam temperature control.
Steam Turbines: Details of construction, accessories, governing, turbine blades, power calculations, arrangement of turbines, industrial turbines.
Condensers and Cooling Towers: Performance, heat transfer design, calculations, efficiencies, detail construction, cooling water circuit, environmental aspects.
Hydro Electric Plant
Hydrology, rainfall measurement hydrographs, flow duration curves, site selection, classification of hydro stations, capacity of hydro stations, selection of prime movers, governing of water turbines, operation of different components of hydro station reservoirs, dam, spillway, canals, penstock, water hammer surge tank, Draft-tubes, specific speeds of turbines, Advantages of hydro station.
Gas Turbine Power Plant
General features and characteristics and their application power plants, Analysis of different cycles, components of gas turbine power plants, governing system of gas turbine plant, advantages of G. T. plant, Gas and steam turbines, combined cycles – Thermodynamic analysis for optimum design,

	advantages and performance of combined cycles, economics of combined cycle. Combined cycle with nuclear power plants, Diesel electric power plant: Thermodynamic cycle analysis, supercharge of diesel engines, different systems of diesel power plant, environmental aspects. Power Plant Economics Fluctuating load on power plants, load curves, various performance factors of power station. Effect of variable load power plant design and operation. Economic analysis of power plants, tariffs, load division, combined operation of different power plants, heat rate, incremental heat rate, selection of power plant and station equipments.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assesment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA

Department: Mechanical Engineering

Course No: **MEL431**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Advanced Mechanism**			
Course Coordinator	**P. M. Padole**			
Course Objectives :	To impart basic understanding of design of mechanisms, applications and optimum selection of the mechanism for intended function.			
POs	a, b, c, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**3**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Applied linkage synthesis; Co.,
	Author	Tad D.C
	Publisher	Addison Wesley publication
	Edition	1964
2.	Title	Advanced mechanism design;.,
	Author	Sandor G.N., Erdman A. G
	Publisher	Prentice Hall Inc
	Edition	1984
3.	Title	Kinematics and mechanisms design;,
	Author	Suh C.H., Radcliff C.W.
	Publisher	John Wiley &Sons
	Edition	1978

Content	Introduction to kinematics, types of mechanism, kinematics synthesis, science of relative motion, tasks of kinematic synthesis with practical applications, Degree of freedom, class-I, class-II chain, Harding's notation, Grashof criterion, Grubler's criterion. Introduction to position generation problem, concept of pole, two & three position generation synthesis, pole triangle, Relationship between moving & fixed pivots, Four position generation, opposite pole quadrilateral, center point & circle point curve, Burmester's point. Matrix method for position generation problem, rotation matrix, displacement matrix. Introduction to function generation problem, co-ordination of input-output link motion, relative pole technique, inversion technique, overlay technique, graphical synthesis of quick return mechanisms for optimum transmission angle. Types of errors, accuracy points cheby shev's spacing and frudenstein's equation. Introduction to path generation problem, synthesis for path generation with and without prescribed timing using graphical method. Coupler curves, cognate linkages, Robert's law of cognate linkages. Complex number method for path generation problem 3 precision point Synthesis for infinitesimally separated position, concept of polode and centrod, Euler's savery equation, inflection circle, Bobbilier and Hartman's construction. Optimal synthesis of planer mechanisms, least square method. Introduction to spatial mechanisms, D-H notations, Introduction to kinematic analysis of robot arms.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assesment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 414**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**TRIBOLOGY**			
Course Coordinator	**A. A. Thakre**			
Course Objectives :	To understand basic lubrication mechanism and various lubrication systems. To understand the friction and wear phenomenon To understand the concept of nano tribology and green tribology and its application for various mechanical systems or processes.			
POs	a, b, d, e, h, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**3**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Bearing Design & Application
	Author	Wilcock, Banter
	Publisher	McGraw Hill Co
	Edition	1st Ed 1957
2.	Title	Bearings Reference Issue;, ,
	Publisher	NRB Bearing Mumbai
	Edition	1999
3.	Title	Cams (Design, Dynamics & Accuracy);.,
	Author	Rothbent
	Publisher	John Wiley &Sons Inc
	Edition	1956
4.	Title	Tribology Handbook;, ,
	Author	Duddley; Crewan Design Neabe M. J. London
	Publisher	Newness Butterworth
	Edition	1973

Content

Component, Selection, Design and Performance

Bearings

Selection criterion of journal, Antifriction bearings, thrust bearings; dry rubbing bearings, general design considerations and procedure of these bearings.

Study of special types of bearings

Porous metal bearing, Hydrostatics bearings, gas bearings, crankshaft bearings. Oscillatory journal bearings, spherical bearings, universal couplings. Study of following machine elements from the point of view of friction, gear and lubrication, cams, all types of gears, power transmission chain, clutches and brakes. Design of following from the point of view of friction, gear and lubrication: wire cables / control cables, slides, valves, piston rings, cylinders & liners, seals.

Gear

Analytical methods of gear analysis, zero and non-zero gear consideration, gear measuring methods, gear resistant parts, material selection, hard surface coatings: selection and applications.

Lubricants

Selection of lubricant type, oils, gases, solid lubricants and coatings, other liquids.

Lubrication of components

Plain bearings, antifriction bearings, gears, cams, roller chains, slides, couplings, wire ropes.

Lubrication Systems

Selection of systems, circulation systems, storage tank, pumps, filters, centrifuges warning & protection devices heaters and coolers, miscellaneous. Constructions like lubricant change periods, tests, deterioration, hazards.

Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 416**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	Y
Type of course				
Course Title	**Industrial Robotics**			
Course Coordinator	**S. S. Chiddarwar**			
Course Objectives :	• To gain fundamental skills underlying the mechanism and control of manipulators • To obtain knowledge and understand basic concepts of industrial robotics, in terms of classification, kinematics, in terms of classification, kinematics, sensors and actuators, dynamics and motion planning for typical application. • To implement robots for various applications in industry, service, society and surveillance.			
POs	a, b, c, d, i, j			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**3**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title	Robotics		
	Author	Fu K.S, Gonzalez R.C., Lee C.S.G.		
	Publisher	McGraw Hill		
	Edition	1987		
2.	Title	Robotics for Engineers		
	Author	Koren Y.;		
	Publisher	McGraw Hil		
	Edition	1985		
3.	Title	Robotics		
	Author	Craig J.J		
	Publisher	Addison Wesley		
	Edition	1986		

Content	**Introduction** Construction of manipulators, advantages and disadvantages of various kinematic structures. **Actuators** Pneumatic, hydraulic and electric. Characteristics and control. Nonservo robots, motion planning. Feed back systems, encoders, servo control PTP and CP. **Introduction to Kinematics** Homogeneous coordinates, solution of the inverse kinematics problem, multiple solutions, jacobian, work envelopes. **Trajectory planning** Manipulator dynamics and force control. **Sensors** Vision, ranging, laser, acoustic, tactile. Developments in sensor technology, sensory control. Programming Language: VAL, RAIL, AML. Mobile robots, walking devices. Robot reasoning and Robot applications.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP 302**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Thermal Lab. : [(0-0-2); Credits : 2]**			
Course Coordinator	**S. B. Thombre**			
Course Objectives :	Objective is to make the students understand : how the thermal conductivities of different materials are estimated how hTc on various surfaces can be calculated different boiling regimes and critical heat flux values error involved in the estimation of different parameters.			
POs	a, b, c, d, e, g, h, i, j			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Content	Thermal conductivity of insulating powder. To compare theoretical & practically observed temperature distribution (pin fin) experiment in a pin fin when subjected to forced and convection. To compare performance of HX in parallel & counter flow mode. To determine heat transfer coefficient over a cylindrical body under transient conditions. To determine thermal efficiency of solar collector under natural and forced convection of operation. To determine thermal conductivity of metal rods. To determine heat transfer coefficient under filmwise / dropwise condensation. To observe the different boiling regimes on a cylindrical rod. To determine critical heat flux To determine htc for flow through pipes To determine htc for flow through pipes forced convection from a vertical / horizontal / inclined plates.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP306**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**MACHINE DRAWING LAB.**			
Course Coordinator	**H. P. Jawale**			
Course Objectives :	**Objectives** : This course will teach the practice followed for graphical interpretation of mechanical comments designed by design section, so that the actual manufacturing			
POs	a, b, c, e, f, j			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**0**	**0**	**2**	**02**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Content	**List of Practicals:** 1. Pencil Drawings of some standard components: Two sheets. 2. Pencil Drawings of standard assemblies with components: 2 sheets (2 different assemblies) 3. Pencil Drawings of Exploded View of a small assembly: One sheet. 4. Computer print out of a small assembly with components: One Assembly. 5. Computer Print out of a large assembly with component drawings, subassembly drawings and assembly drawings using all standard formats: One Assembly. 6. Computers print out of Production Drawing and Process sheets for two components.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP308**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	ENERGY CONVERSION – II LAB.			
Course Coordinator	**S. B. Thombre**			
Course Objectives :	Basically uses all the applications of steam & its measurements leading to Thermal Power Plant using any fuel.			
POs	a, b, c, d, g, h, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**0**	**0**	**2**	**02**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Content	List of Practicals: 1. Trial on single cylinder CI engine with energy balance. 2. Trial on multicylinder CI engine with energy balance. 3. Trial on single cylinder SI engine with energy balance. 4. Morse test on muticylinder IC engines. 5. Trial on reciprocating air compressor. 6. Trial on vapor compression refrigeration system. 7. Trial on air-conditioning system. 8. Study of gas turbine. 9. Study of jet propulsion system. 10. Study of IC engines.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA

Department: Mechanical Engineering

Course No: **MEL 307**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Fluid Mechines**			
Course Coordinator	**V. R. Kalamkar**			
Course Objectives :	(1) To learn and understand principles of fluid mechanics and power with applications. Topics include: fluid properties, conservation of energy, momentum, incompressible flow in pipes, standard symbols, components and control of hydraulic and pneumatic systems. (2) To provide the student the necessary analytical skills to solve and analyze a variety of fluid mechanics and fluid power related problems.			
POs	a, b, c, d, e, h, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Hydraulic Machines
	Author	Vasandani V.P
	Publisher	Khanna Publishers
	Edition	1984
2.	Title	Fluid Mechanics and Fluid Machines
	Author	Kumar D.S
	Publisher	S.K.Kataria & Sons
	Edition	4th Ed 1992
3.	Title	Fluid Mechanics and Fluid Machines,;,
	Author	Bansal R.K
	Publisher	Laxmi Publications
	Edition	7th Ed 2002
4.	Title	Hydraulic Machines,.;
	Author	Lal Jagdish
	Publisher	Metropolitan Book Co. Ltd,
	Edition	7th Ed 1984
5.	Title	Hydraulic Machines,; S.Chand &Co.,
	Author	Rajput R.K.
	Publisher	1998
	Edition	1st Ed.
6.	Title	Centrifugal Pumps and blowers,.;.
	Author	Church A.H., Lal J
	Publisher	Metropolitan Book
	Edition	6th Ed 1973
7.	Title	Mechanics of Fluids,.;,
	Author	Massey B.S
	Publisher	Van Nostrand Reinhold Co.
	Edition	6th Ed 1989
8.	Title	Turbines, Fans and Compressors;,
	Author	Yahya S.M.
	Publisher	Tata McGraw Hill
	Edition	1999

Content	**Roto dynamic machinery** Operation, performance and similarity laws of roto dynamic machineries

	Pumps Types of pumps, fans, blower, and compressors, cavitation in pump Hydraulic design of centrifugal type pump and blower. Hydraulic design of Positive displacement type and jet pump type machinery. **Turbines** Impulse and reaction type hydro turbines; operation, performance, similarity laws, Hydraulic design of impulse type and radial flow type hydro turbines.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP 307**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				

Course Title	**Fluid Machines Lab.**
Course Coordinator	**V. R. Kalamkar**
Course Objectives :	(1) To learn and understand principles of fluid mechanics and power with applications. Topics include: fluid properties, conservation of energy, momentum, incompressible flow in pipes, standard symbols, components and control of hydraulic and pneumatic systems. (2) To provide the student the necessary analytical skills to solve and analyze a variety of fluid mechanics and fluid power related problems.
POs	a, b, c, d, e, h, i, j, k
Semester	Odd: **Yes** Even: No

	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title			
	Author			
	Publisher			
	Edition			

Content	Practicals based on syllabus of Fluid Machineries.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 309**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Machine Design – II**			
Course Coordinator	**P. M. Padole**			
Course Objectives :	To develop the skill to understand the basics of design aspects of mechanical systems. Design of Mechanical Components and assemblies for industrial & domestic applications. Development of foundation for advanced machine design.			
POs	a, b, c, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Mechanical Design of Machine;,
	Author	Maleev V.L., Hartman J.B
	Publisher	CBS Pub. & Distributors
	Edition	1983
2.	Title	Machine Design; Kogakusha,
	Author	Black P.H., Adams O.E.
	Publisher	Mc Graw Hill,
	Edition	1968
3.	Title	Mechanical Engineering Design;,
	Author	Shigley J.E
	Publisher	Mc Graw Hill International
	Edition	1986
4.	Title	Machine Design –An Integrated Approach;,
	Author	Norton R.L.
	Publisher	Prentice Hall, New Jersey
	Edition	1996
5.	Title	Design Data Book;,
	Author	Shiwalkar B.D
	Publisher	Central Techno Publications Nagpur.

Content

Bearings and Design for rotating bodies
Surface finish, frictions wear, lubrication, oil seals, design of journal bearings for radial and thrust loads, selection of ball and roller bearing for radial and thrust loads. Failures of antifriction bearing, design of hydrostatic pocket type thrust bearing such as circular step thrust bearing, bearing housing.

Coupling
Types of shaft coupling, design of flange coupling, flexible bush coupling. Flywheel: Coefficient of fluctuation of energy and Coefficient of fluctuation of speed, energy store in flywheel, stresses in flywheel, design of flywheel.
Friction and chain drive
Types of belts & belt material, analysis of belt tension, condition for transmitting maximum power, design of flat belt, flat belt pulley. V belt drive: Types of V-belt, analysis of V-belt tension, design of V belt pulley, Roller change drive: Velocity ratio and length of chain, design of chain, dimensions of tooth profile, sprocket.
Spur, Helical and Bevel Gear
Review of Kinematics of gears & terminology, interference, tooth profiles, formative number of teeth etc. Buckingham equation, design of spur gear drive, helical gear drive. Bevel gear drive: Types of

	bevel gear proportions of bevel gear, force analysis of bevel gear drive design of bevel gear drive. Worm Gear and Hoisting Systems Worm gear drive: Types and proportion of worm and worm gear, force analysis, beam strength of worm gear teeth, dynamic tooth load, wear load, thermal rating of worm gear, design of worm and worm gear. Introduction to haulage system, design of wire rope, sheave and drums, Electric motor rating, types of motor like AC, DC, their Characteristics, controls, selection motors.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP 309**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Machine Design-II Lab**.			
Course Coordinator	**P. M. Padole**			
Course Objectives :	**Objectives** : 1. To expose the students to the practical aspects of assembly design. 2. develop basic understanding of NDT techniques 3. Exposure to advanced software's for Machine Design.			
POs	a, b, c, j			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title			
	Author			
	Publisher			
	Edition			
2.	Title			
	Author			
	Publisher			
	Edition			
2.	Title			
	Author			
	Publisher			
	Edition			
2.	Title			
	Author			
	Publisher			
	Edition			
Reference Books	Title			
	Author			
	Publisher			
	Edition			
Content	Practical based on the above syllabus of Machine			
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%			

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 310**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Manufacturing Process & Automation**			
Course Coordinator	**S. S. Chiddarwar**			
Course Objectives :	• To learn the concept of automated production lines, system configuration, transfer line, part handling system, storage system. • To understand programming of CNC machines, robots, AGV's • To learn manufacturing of gear and plastic processing • To introduce fundamental concepts and elements of CAD, CAM.			
POs	a, b, c, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books		
1.	Title	Production Technology,;.,
	Author	Sharma P.C
	Publisher	S. Chand & Co. Ltd
	Edition	10th Ed 2003
2.	Title	Automation production systems and CIMS
	Author	Groover M P
	Publisher	Prentice Hall of India
	Edition	9th Ed 2002
2.	Title	Computer Control of Manufacturing Systems
	Author	Koren Yoram
	Publisher	McGraw Hill
	Edition	3rd Ed, 1986
	Edition	

Content

Gear Manufacturing

Gear casting gear milling, gear shaping, gear bobbing for spur helical and bevel gear. Tooling and selection of cutting parameters, Process accuracy and quality of gears. Gear stamping. Process, gear drawing. Processes, Rolling process, gear finishing gear shaving, gear lapping, gear honing.

Processing of plastics: Plastic molding methods, thermoforming, coding, laminate forming, machining of plastic, reinforced plastics

Press working

Die cutting operation, classification, types of presses, press terminology, introduction to shaping operations, bending forming & drawing

Introduction of Jigs and Fixtures

Difference between jigs and fixtures, uses, principles of jigs and fixture design. Materials, principles of location, methods of location, Clamping requirements, types of clamps, jig bushes, drilling jigs, milling fixtures, classification of fixtures.

Automated Machines

NC, Basic components, co-ordinate system, types, NC part programming, DNC, types, advantages, limitations, CNC, AC, CIM, FMS. Robotics: Robot anatomy, configurations, types of control, accuracy & repeatability of robot, end effectors, sensors, robot programming, robot applications.

Automated material handling and Inspection

Types of automation, reasons for automation, automated guided vehicle, types, applications, traffic

	control and safety. ASRS, types, basic components, applications, carosel storage system. CAQC, CAPP, G.T.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP 310**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Man. Process & Automation Lab.**			
Course Coordinator	**A. B. Andhare**			
Course Objectives :	**Objectives :** 1. To learn operation and programming software's for CNC machines. 2. To design a FMS and carry out its techno-economic analysis 3. To learn programming and operation of material handling systems like conveyors, AGVs, Robots, ASRS.			
POs	a, b, c, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**0**	**0**	**2**	**02**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books **1.**	Title	1.		
	Author			
	Publisher			
	Edition			
Reference Books	Title			
	Author			
	Publisher			
	Edition			
Content	1. Performance, Simulation on CNC lathe (at least two Complex Geometries) 2. Performance, Simulation on CNC milling (at least two Complex Geometries) 3. Practice Programming on Manual Part Program 4. Practice Programming on APT 5. Case Study on Automated System of any Industry. 6. Performance/ Practical on Robot. 7. 7. Part Coding and Group Technology			
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%			

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL445**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Automation in Production**			
Course Coordinator	**Y. M. Puri**			
Course Objectives :	**Objectives** : 1. To teach graduates various automation systems and its components, so that they all like to apply it to the various practical situations in industries.			
POs	b, c, j			

Semester	Odd: **No**		Even: Yes	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Automation, production System & CIMS
	Author	Groover M.P
	Publisher	Prentice Hall of India,
	Edition	2nd Ed, 2002
2.	Title	CAD/CAM
	Author	Zimmers, Groover
	Publisher	Prentice Hall of India,
	Edition	9th Ed.; 1998
3.	Title	Numerical Control and Computer Aided Manufacturing
	Author	Kundra, Rao, Tiwari
	Publisher	TMH
4.	Title	Computer Control of Manufacturing Systems
	Author	Koren Yoram
	Publisher	McGrawHil
	Edition	3rd Ed, 1986
Reference Books 1.	Title	
	Author	
	Publisher	
	Edition	

Content

Automation

Definition, types, reasons for automating, arguments for and against automation. Types of production, functions in manufacturing, Organization and information processing in manufacturing. Automated Flow Lines- Methods of work part transport, Transfer mechanisms, Buffer storage. Analysis of flow lines- General terminology and analysis, analysis of transfer lines without storage, partial automation, automated flow lines with storage buffers, manual assembly lines. Line Balancing Problem, Methods of line balancing Automated Assembly Systems- Types, parts delivery system

Numerical Control Production Systems

Basic concepts, coordinate system and machine motion- Types of NC systems- Point to point, straight cut and continuous path. Machine control unit and other components, Tape and tape readers.

NC part programming

Punched tape and tape formats, NC words, methods of part programming, manual part programming: APT programming, Direct numerical control. Computer numerical control. Adaptive control. Applications and economics of NC.

Industrial Robotics

Introduction, robot anatomy, robot control systems, accuracy and repeatability and other

	specifications, end effectors, sensors, introduction to robot programming, safety monitoring. Robot applications- Characteristics of robot applications, work cell layout, robot applications in material handling, processing, assembly and inspection. Automated material handling & storage-Conveyor systems Roller conveyer, Skate wheel conveyer, Belt conveyers, Chain conveyers, Slat conveyers, Overhead trolley conveyers, Infloor towline conveyers, Cart on track conveyers. Automated Guided Vehicle Systems Types, driverless trains, AGVS pallet trucks, AGVS unit-load carriers. Vehicle guidance & Routing, Traffic control & safety, System management, Analysis of AGVS systems, AGVS applications. Automated Storage & Retrieval System Types, Unit load AS/RS, mini load ASI{S , man on board AS/RS , automated item retrieval system, deep lane AS/RS -Basic components & special features of AS/RS, Carousel storage systems, Work in process storage, quantitative analysis. Automated inspection & Group technology Automated inspection principles & methods -100% automated inspection, off -line & on -line inspection, distributed inspection & final inspection; Sensor technologies for automated inspection, coordinate measuring machines -construction, operation & benefits; Machine vision -image acquisition & digitization, image processing & analysis, interpretation. Machine vision applications Other optical inspection methods -Scanning laser systems, linear allay devices, optical triangulation techniques. Group Technology Part families, parts classification & coding, Opitz classification systems, production. Flow analysis; Machine cell design -composite pat1 concept, types of cell design, best machine arrangement, benefits of group technology. 1. Computer aided manufacturing -Manufacturing planning, manufacturing control; Computer integrated manufacturing; 2. Flexible manufacturing systems -Components, Types of systems, FMS layout configuration computer functions, data files, system reports, FMS benefits. 3. Computer aided process planning: Retrieval CAPP systems, generative CAPP systems, benefits of CAPP. 4. Shop floor controls. 5. Computer Process Control
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP445**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Automation in Production Lab.**			
Course Coordinator	**Y. M. Puri**			
Course Objectives :	**Objectives** : 1. To study the various OR tools, 2. Study to apply a appropriate model to the given situation. 3. Formulate the problem 4. solve and analyse the problem			
POs	b, c, j			

Semester	Odd: No		Even: **Yes**	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**0**	**0**	**2**	**02**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books		
1.	Title	
	Author	
	Publisher	
	Edition	
2.	Title	
	Author	
	Publisher	
	Edition	
3.	Title	
	Author	
	Publisher	
	Edition	
4.	Title	
	Author	
	Publisher	
	Edition	

Content	1. Performance, Simulation on CNC lathe (at least two Complex Geometries) 2. Performance, Simulation on CNC milling (at least two Complex Geometries) 3. Practice Programming on Manual Part Program 4. Practice Programming on APT 5. Case Study on Automated System of any Industry. 6. Performance/ Practical on Robot. 7. Part Coding and Group Technology
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 423**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Measurement & Signal Processing**			
Course Coordinator	**H. P. Jawale**			
Course Objectives :	**Objectives** : 1. By learning the subject, students will be able to understand the process of measurement of various mechanical quantities, for further processing the day to day industrial application. The logic behind signal measurement and processing applied for process measurement is the basic target to the students.			
POs	a, b, c, dg, h, i, j			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Principles of Measurement Systems
	Author	John P. Bentley
	Publisher	Pearson Education Limited
	Edition	--
2.	Title	Mechanical Measurement Systems
	Author	T.G. Beckwith, John Lienhard,
	Publisher	Pearson Publishing House
	Edition	--
3.	Title	Instrumentation Measurement and Analysis,
	Author	Nakara Choudhari
	Publisher	TMH Publications
Reference Books	Title	Measurement Systems
	Author	Doeblin O.E
	Publisher	McGraw Hill Publications
	Edition	--

Content	General Principles, Purpose and performance of measurement systems, Structure and Examples of measurement systems, Block diagram symbols Systematic characteristics, Generalised model of a system element, Statistical characteristics, Identification of static characteristics – calibration Measurement error of a system of ideal elements, the error probability density function of a system of non-ideal elements, Error reduction techniques, Theory of Experimentation, Elements of Measurement Systems Classification, Principle, Construction, Range and working of following instruments (Analytical Treatment Not included) Displacement, force, speed, torque, Flow, Level, Pressure, Sound and Light Signal Processing Sensing elements, Types of Signals, Signal Processing and Conditioning elements, Data Acquisition Digital Techniques in Mechanical Measurements, Readouts and Data Processing, analysis and Data Presentation elements.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP423**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Measurement & Signal Processing Lab.**			
Course Coordinator	**H. P. Jawale**			
Course Objectives :	By learning the subject, students will be able to understand the process of measurement of various mechanical quantities, for further processing the day to day industrial application. The logic behind signal measurement and processing applied for process measurement is the basic target to the students.			
POs	a, b, c, dg, h, i, j			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**0**	**0**	**2**	**02**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books	Title			
	Author			
	Publisher			
	Edition			
Reference Books	Title			
	Author			
	Publisher			
	Edition			
Content	Practical based on syllabus of Measurement & Signal Processing.			
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%			

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 415**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	Y
Type of course				
Course Title	**Mechanical Vibration**			
Course Coordinator	**A. Chatterjee**			
Course Objectives :	**Objectives** : 1) To learn importance of vibration in machine design and dynamic stress analysis. 2) To learn how to present dynamic stress analysis 3) To learn how to present dynamic stress related failure in machines and structure 4) To learn vibration measurement in industrial machines.			
POs	a, b, c, d, e, h, i, j, k			

Semester	Odd: No		Even: **Yes**	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**3**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	MEL 302 : TOM-I			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Theory & practice of Mechanical vibration,
	Author	Rao, Gupta
	Publisher	NewAge Publication
	Edition	2nd Ed.;
2.	Title	Theory of Vibration,
	Author	Thomson;
	Publisher	CBS publication
	Edition	3rd Ed
3.	Title	Elements of Vibration analysis
	Author	Meirovitch
	Publisher	McGraw Hill
	Edition	2nd Ed
4.	Title	Vibration Problems in Engineering,
	Author	Timoshenko
	Publisher	John Willey & Sons
	Edition	5th Ed
Reference Books	Title	Mechanical Vibration
	Author	S. S. Rao
	Publisher	Pearson Education
	Edition	Fourth

Content

Introduction to vibration in mechanical and structural systems. Discrete system modeling. Hamilton's principle and Lagrange's equation. Free and forced vibration response of single degree of freedom system with and without damping under harmonic excitation. Discussion on various types of damping; viscous, coulomb, hysteretic etc. Forced response under periodic excitation and transient response through Du-hamel's integral. Concept of response spectrum.

Rotor whirling and critical speed. Vibration isolation and transmissibility ratio. Vibration isolation in automobiles. Dynamic vibration absorber. Torsional vibration in rotors. Numerical simulation in Cosmo-Kgp using Bond graph modeling and in Simulink of Matlab.

Modeling of multi degree of freedom systems. Determination of natural frequencies using matrix iteration and deflation technique. Concept of mode shapes and orthogonality principle. Rayleigh's quotient. Free and forced response through modal analysis.

Vibration of continuous systems. Longitudinal vibration of rods, transverse vibration of beams and

	torsional vibration of shafts. Determination of natural frequencies and mode shapes under various boundary conditions. Introduction to FEM modeling of continuous systems. Free and forced response through modal analysis. Introduction and distinguishing characteristics of nonlinear vibration. Phase plane, equilibrium points and limit cycles. Random vibration, correlation and spectral density functions. Vibration measurement parameters and procedures. Vibration transducers and instruments. Source of vibration in Machineries. Role of vibration measurement and analysis in machine design and machine condition monitoring.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 424**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Industrial Engineering & Management**			
Course Coordinator	**K. M. Ashtankar**			
Course Objectives :	**Objectives** : To understand various fundamental disciplines of management like personnel management, marketing management, financial management etc. To apply this basic knowledge to understand the working of corporate world.			
POs	a, b, c, d, g, h, i, j			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Principles of management
	Author	Koontz, O Daniall
2.	Title	Financial management
	Author	Kuchal S.C
	Publisher	Chaitanya Publishing House
	Edition	1996
3.	Title	Industrial organization & engineering Economics;
	Author	Banga T.R.,.Sharma S.C.
	Edition	Khanna Pub.
4.	Title	Principles of marketing management,
	Author	Kotler P., Stauton William
	Publisher	5th Ed.; PrenticeHall, 1985

Content

Principles of management
Concepts of management, development of scientific management, principles of Fredric Taylor & functionssuchasplanningorganizing,staffing,leadingmotivating,communicating,controlling,decision making, span of control
Personal management
Meaning, functions of personal management, manpower planning, collective bargaining, wages & salary administration, labor welfare, training, trade unions, industrial factories Act, industrial boilers Act, Trade union act.
Plant management
Plant location, plant layout, types of maintenance such as break down, predictive & preventive maintenance, stores of management, industrial safety, causes & cost of accidents, safety programs, production planning & control, job, batch & process type of production
Marketing management
Definition & selling & modern concept of marketing, market research, new product development, product life cycle product launching, sales promotion, pricing, channels of distribution, advertising, market segmentation, marketing mix.

	Material management Importance of material management, classification, codification, forecasting, necessity of inventory Financial management Sources of finance, financing organizations, types of capital, elements of costs & allocation of indirect expenses, cost control, break even analysis, budgets & budgetary control, equipment replacement policy, make or buy analysis, balance sheet, ratio analysis, profit & loss statement.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL429**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Renewable Energy Sources**			
Course Coordinator	**D. B. Zodpe**			
Course Objectives :	**Objectives** : 1. To explain concepts and mathematical treatment related to solar energy utilization. 2. to explain concepts related to solar collectors, solar air heaters, their types, solar radiation measurements, storage and applications. 3. to explain energy extraction systems, advantages, limitations of unconventional energy sources like wind energy, ocean energy (OTEC / Tidal / Wave) geothermal energy, magneto hydrodynamic power generator, biogas and biomass.			
POs	a, b, c, d, , g, h, i, j			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books **1.**	Title	Solar energy
	Author	Sukhatme S.P
	Publisher	Tata Mc Graw Hill,
	Edition	2nd Ed 2003
2.	Title	Solar energy
	Author	Duffie, Beckman
	Publisher	John Wiley & Sons
	Edition	1974
3.	Title	Non Conventional energy sources
	Author	Rai G.D
	Publisher	Khanna Publishers
	Edition	3rd Ed 1995
4.	Title	Solar Energy – Fundamentals & Applications
	Author	Garg H. P.,Prakash J.
	Publisher	Tata McGraw Hill,
	Edition	1997
5.	Title	Biogas Techno.-A practical Handbook,
	Author	***Khandelwal K., Mahdi S***
	Publisher	***TMH***
	Edition	***Ist Ed, 1988***
6.	Title	book on Thermal Engg,
	Author	Thombre S.B.
	Publisher	Green Brains Publication
	Edition	1st Ed; 2003

Content	Renewable energy sources Need for alternative sources of energy, various options available, principles of energy conversion using solar energy, wind energy, Ocean energy, Geothermal energy and MHD power generation. Solar Energy Introduction, Spectral distribution of solar radiation, beam and diffused radiations, measurement of solar radiation, pyranometer, pyrhelio meter, sunshine recorder. Solar radiation geometry, radiation on tilted surface, tilt factors. Solar flat plate collectors

	Liquid flat plate collector & their analysis, collector efficiency factor and heat removal factor, collector efficiency, Concept of selective surfaces, some novel designs of solar collectors, Solar air heaters and their analysis. Concentrating Collectors Cylindrical parabolic collectors, compound parabolic collectors, parabolied collectors, their construction and principle of operation, advantages and drawbacks, tracking systems Solar energy storage. Applications of solar energy Water heating, space heating, drying, refrigeration, distillation, cooking, PV systems. Bio-Gas Introduction to biogas generation, fixed dome & floating drum biogas plants, their constructional details, factors affecting generation of biogas, utilization of biogas. Biomass Introduction, methods of obtaining energy from biomass, inceneration, thermal gasification. Up draft and down draft gasifiers, their constructional details, Applications of producer gas. Wind & Ocean Energy Power in wind, basic principles of wind energy conversion, , basic components of WEC Systems, Savonius and Darrieus rotors, application of wind energy. Ocean energy Introduction, Ocean Thermal Electric Conversion (OTEC), open and closed cycle of OTEC, hybrid cycle, energy from tides, generation components of tidal power plants, single and double basin design arrangement, estimation of tidal power and energy.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 407**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Biomechanics**			
Course Coordinator	**R. V. Uddanwadikar**			
Course Objectives :	1. To understand the basic machines of human body 2. application of Engineering tools and softwares for the betterment of society 3. to understand and analyze human body as a mechanical assembly of linkages.			
POs	a, d, g, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title			
	Author			
	Publisher			
	Edition			
Reference Book 1.	Title			
	Author			
	Publisher			
	Edition			

Content	
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL412**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Air Conditioning**			
Course Coordinator	**D. B. Zodpe**			
Course Objectives :	1) To introduce and explain concepts topics related to Air Conditioning, Psychometrics, psychometric processes, comfort, its measurement, comfort chart, effective temperature, coding load estimation, design of summer, winter, monsoon, Air Conditioning systems, duct design and selection of air outlets. 2) To make student aware about various equipments / systems used in Air Conditioning like room air conditioners, packaged Air Conditioning like room air conditioners, packaged air conditioners, central air conditioning, filters etc. 3) To develop mathematical treatment regarding psychometrics, psychometric processes, design of summer / winter / monsoon Air Conditioning and duct design.			
POs	a, b, c, d, e, f, h, i, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books		
1.	Title	Principles of Refrigeration,.;
	Author	Dossat Roy J
	Publisher	Pearson Education Asia Publication
	Edition	--
2.	Title	Refrigeration and Air conditioning,;
	Author	Arora C.P.
	Publisher	Tata Mc Graw Hill Publication
	Edition	2nd Ed.
3.	Title	Refrigeration and Air conditioning
	Author	Ballaney P.L.
	Publisher	Khanna publishers
4.	Title	Refrigeration and Air conditioning
	Author	Prasad Manohar
	Publisher	New edge Publication
	Edition	2nd Ed
5.	Title	Refrigeration and Air conditioning,
	Author	Khurmi R.S.
	Publisher	Eurasia publishing house
	Edition	3rd Ed
6.	Title	A course in Ref. &Air Conditioning
	Author	Arora, Domkundwar
	Publisher	Dhanpat Rai Publications
	Edition	7th Ed
7.	Title	Air conditioning principles and systems
	Author	Pita Edward G
	Publisher	Prentice Hall
	Edition	4th Ed

Content	Fundamentals of Air conditioning Introduction to air conditioning, psychometrics, important terms and definitions, enthalpy of air,

	adiabatic saturation temperature, measurement of properties, psychometric chart, its construction and use. Psychometric processes Mixing, mixing with condensation, sensible heating and cooling, humidification and dehumidification, bypass factor and its role, evaporative cooling, drying process, working of air-washer. Air-conditioning systems Sensible heat factor, design of summer air conditioning system, calculation of dehumidified air quantity and apparatus dew point, ERSHF method, air-conditioning systems for monsoon and winter, air conditioning systems using all fresh air. Comfort and Cooling load Estimation Comfort and its requirements, mechanism of body heat loss, effect of heat on body and body defense mechanism, effective temperature, comfort chart and its use, factors affecting human comfort, Cooling load estimation, components of cooling load, sensible and latent loads, ASHRAE and CARRIER methods of load estimation. Industrial practices in Air conditioning General layout of central air conditioning Plant, Design of chilled water and condenser water piping, selection of pump. Fans, types and characteristics, filters types and selection, defrosting methods, commissioning and testing of air conditioning systems. Applications of air conditioning, working of room air-conditioning and split air-conditioning and package air-conditioning. Air Distribution and duct design Components of air handling systems, principles of air distribution, types of supply and return air openings and related definitions, consideration s for selection and location of supply and return air openings. Duct design: General duct design, rules, principles of duct design, equivalent diameter of ducts ducting materials, friction chart and its use, methods of duct design.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 311**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Metrology & Quality Assurance**			
Course Coordinator	**P. V. Kane**			
Course Objectives :	**Objectives** : 1. To educate students on different measurement systems for metrology purpose 2. To introduce concepts of linear, angular, roughness thread, gear measurements 3. To give various concepts of quality assurance like control charts, acceptance sampling and application of softwares for the same.			
POs	b, c, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Engineering Metrology
	Author	*I. C. Gupta*
	Publisher	*Dhanpat Rai*
	Edition	*2000*

2.	Title	Engineering Metrology
	Author	*R. K. Jain*
	Publisher	*Khanna*
	Edition	*20th 2013*
3.	Title	Statistical Quality Control
	Author	*M. Mahajan*
	Publisher	*Dhanpat Rai*
	Edition	*2012*
4.	Title	Probability and statistics
	Author	Spigel M.R
	Publisher	McGraw Hill Book Co
	Edition	1980
5.	Title	Fundamentals of Mathematical Statistics
	Author	Gupta, Kapoor
	Publisher	S.Chand & Sons
	Edition	8th Ed, 1998
2.	Title	Quality Control and Industrial Statistics
	Author	Duncan A.J., Irwin Richard D
	Publisher	INC, USA
	Edition	1965
6.	Title	Total Quality Control
	Author	Feigenbaum F.V.
	Publisher	McGraw Hill International Edition
	Edition	3rd Ed, 1987
7.	Title	The Assurance Sciences;,.
	Author	Halpern S
	Publisher	Prentice Hall India Ltd New Delhi
	Edition	1979
8.	Title	Managerial Statistics;
	Author	Winston, Duxbury Zappen
	Publisher	Thompson Learning Inc.
	Edition	--
Reference Books	Title	
	Author	
	Publisher	
	Edition	

Content	Statistics Probability theory, Random variables (discrete & continuos), binomials, poisons, normal and other standard distribution. Chebychev's inequality, joint distribution, moment generation function, measure of control tendency, variability, control limit theorem, sampling theory and distribution, estimation theory. Hypothesis testing, x2 goodness fit curves, Regression analysis. Quality Assurance Concept of quality characteristics, Value of quality, Quality of design and conformance, Process capability, selective assembly, concept in total quality control and quality system, Quality assurances. SQC Quality cost aspects. Job plan. Case study in value analysis. Process control - Concept of S.Q.C. control chart for variable additives and attributes. Multi-characteristics control chart. Acceptance sampling plan, single, Double and sequential sampling, ACL, LTPD concept. AOQL and rectification plan. Economic of inspection. Motivation for quality assurance. TQM Total quality management, Zero-defect program, Quality circle
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP 311**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Metrology & Quality Assurance Lab.**			

Course Coordinator	**S. S. Chiddarwar**			
Course Objectives :	1. To perform various experiments based on Metrology & Quality Assurance theory like calibration & measurement of various instruments and entities. 2. To use software's for various analysis associated with quality assurance.			
POs	b, c, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title			
	Author			
	Publisher			
	Edition			
Content	Practical based on Syllabus of : Metrology			
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%			

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 410**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**CAD**			
Course Coordinator	**A. M. Kuthe**			
Course Objectives :	Upon successful completion students will be able to: (i) Understand the current available layered manufacturing systems, their operating principles and their characteristics (ii) Be able to describe complementary, secondary fabrication processes (iii) Be able to select the appropriate fabrication technology or technologies for a given task			
POs	a, b, c, d, e, i, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	CAD / CAM problem & practice,.; 2001
	Author	Zeid I
	Publisher	Tata McGraw Hill
	Edition	3rd Ed
2.	Title	Principles of interactive computer graphics;.
	Author	Newman, Sproull
	Publisher	Mc Graw Hill book Co
	Edition	1981
3.	Title	Finite Element Procedures;,
	Author	Bathe K.K
	Publisher	Prentice Hall of India
	Edition	1996
4.	Title	Computer Graphics including CAD, AutoCAD & C,.;S.Chand,
	Author	Kuthe A.M.
	Publisher	2005
	Edition	1st Ed
Reference Books	Title	CAD/CAM principles &applications;,
	Author	Rao P.N
	Publisher	Tata Mc Graw Hill
	Edition	2002

Content

CAD Introduction
Need of machine design, use of computer, computer fundamentals, computer aided design process, CAD configuration, CAD tools, positive and negative points of CAD, CAD and CAM integration.

CAD Hardware
Introduction to hardware specific to CAD, CRT, Random scan technique, raster scan technique, DVST, Raster display, Display systems, sequential scanning and interiaced scan.

CAD Software
Introduction to software specific to CAD, output primitives, line generation algorithm, circle generation, plane curve, transformation, windowing and clipping, line clipping technique, geometrical modeling, CSG technique & B-rep technique.

Finite element method
Introduction, principle of minimum potential energy, types of element, shape function, elemental strain displacement matrix, types of forces, elemental stiffness matrix, elemental force matrix, assembly, truss, introduction to 2 dimensional finite element method.

	Optimization Introduction, Johnson method of optimization normal specification problem, redunant specification problem, introduction to genetic algorithm. **Newer techniques of CAD** Rapid prototyping, laser and non-laser process of rapid prototyping, STL formal of CAD file, introduction to reverse engineering and related software's viz. rapid form.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP 410**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**CAD Lab.**			
Course Coordinator	**A. M. Kuthe**			
Course Objectives :	**Objectives** : Upon successful completion students will be able to: (i) Understand the current available layered manufacturing systems, their operating principles and their characteristics (ii) Be able to describe complementary, secondary fabrication processes (iii) Be able to select the appropriate fabrication technology or technologies for a given task			
POs	a, b, c, d, e, i, j, k			
Semester	Odd: **Yes**		Even: No	

	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	CAD / CAM problem & practice,.;.
	Author	Zeid I
	Publisher	Tata McGraw Hill
	Edition	3rd Ed 2001
2.	Title	Principles of interactive computer graphics;..
	Author	Newman, Sproull
	Publisher	Mc Graw Hill book Co
	Edition	1981
3.	Title	Finite Element Procedures;,.
	Author	Bathe K.K
	Publisher	Prentice Hall of India
	Edition	1996
4.	Title	Computer Graphics including CAD, AutoCAD & C,.; d,
	Author	Kuthe A.M
	Publisher	S.Chan
	Edition	1st Ed 2005
5.	Title	CAD/CAM principles &applications
	Author	Rao P.N
	Publisher	Tata Mc Graw Hill
	Edition	2002

Content

Development of software for design of any mechanical element and system.

Development of menu driven software for graphics using output primitives.

Development of software for transformation using scaling, rotation, reflection.

Development of software for clipping of graphical entities.

Development of software for analysis of one dimensional element using FEM technique.

Software operation of customized FEM software.

Development of computer program for analysis of mechanical element using FEM for user input values.

Development of software for analysis of stress problem using FEM.

	Development of software for design optimization of mechanical element using Johanson method. Use of commands of any computer aided drafting software package viz. AutoCAD, Pro-engineer.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 430**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Adv. I. C. Engines**			
Course Coordinator	**J. G. Suryawanshi**			
Course Objectives :	Introduce to the students 1) fundamentals of solar radiation 2) Estimation of solar energy available. 3) Design and fabrication of solar thermal systems 4) Analyze the solar thermal system 5) Design a solar PV system.			
POs	a, b, c, d, g, h, i, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title	Internal Combustion Engine Fundamentals;,		
	Author	Heywood J.B		
	Publisher	McGraw Hill		
	Edition	1988		
2.	Title	Internal Combustion Engines and Air pollution;,		
	Author	Obert E.F		
	Publisher	Intext Educational Pub		
	Edition	1974		
3.	Title	Internal Combustion Engines,.;		
	Author	Ganesan V		
	Publisher	Tata Mc Graw Hill Publishing Co.		
	Edition	6th Ed		
4.	Title	Internal Combustion Engines		
	Author	Domkundwar V.M		
5.	Title	Internal Combustion Engines,.;.,		
	Author	Mathur M.C., Sharma.R.D		
	Publisher	Dhanpat Rai Pub		
	Edition	8th Ed 2003		

Content

Introduction

Engines types and their operation, Introduction and Historical Perspective, Engine classifications, Engine operating cycles, Engine components, Engine friction, lubrication and cooling, lubrication systems. Frictional losses, blow by losses, pumping loss, Factors affecting mechanical friction

Fuels

Fluid, Solid, gaseous, liquid fuels, SI Engine fuels characteristics, C.I. Engine fuels, characteristics, Rating of engine fuels, I.C. engine fuels - petrol, diesel ENG, LPG, Alcohol, Vegetable oils, Combustion, Combustion stoichiometry - The first low of thermodynamics and combustion, Enthalpies of formation, Heating values combustion efficiency. The second law of thermodynamics applied to combustions. Maximum work, chemical equilibrium, theoretical flame temperature.

SI Engine

S. I. Engine fuel requirements, carburetors, factors attesting carburetion, moderns carburetors, metering systems, choke, altitude compensation, fuel injection systems, multipoint port injection, feedback systems, charge motion within the cylinder swirl, squish, combustion stages, flame propagation cyclic variations in combustion, ignition fundamentals, conventional ignition system, abnormal combustion, knock and surface ignition, knock fundamentals, turbo charging, supercharging

	and scavenging in engines. **C. I. Engines** Essential features of the process, combustion systems. Combustion in direct and indirect injection, fuel spray behavior. Fuel injection systems, fuel pumps, fuel injectors, atomization, combustion in C. I. Engines, ignition delay, certain number, auto ignition. Factors affecting delay. Effects of fuel properties. Abnormal combustion, supercharging and turbo charging in engines. **Pollutant formation & Control** Nature and extent of problem, Nitrogen oxides Kinetics of NO formation, formation of NO2 NO formation in S. I. Engines NOx formation in C. I. Engine Carbon monoxide and unearned hydrocarbon emissions in S.I. and C.I. engines, EGR Particulate emissions, measurement technique. Catalytic converters, particulate traps. **Engine Design and Operating Parameters** Important engine characteristics, Geometrical properties of Reciprocating engines, Brake, Torque & Power, Indicated work per cycle, Mechanical efficiency, Road load power, Mean effective pressure, Specific fuel consumption and efficiency, Air/Fuel and Fuel/Air ratios, Volumetric efficiency, Engine specific weight and specific volume, Correction factors for power and efficiency, Specific emission and emission index, Relationship between performance parameters **Measurement and Testing** Measurement of friction 'power indicated power, Brake power, Fuel consumption, Air consumption, Performance parameters and characteristics: Engine Power, Engine efficiencies, Engine performance characteristics, Variables affecting performance characteristics
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP 430**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Adv. I. C. Engines Lab.**			
Course Coordinator	**J. G. Suryawanshi**			
Course Objectives :	Introduce to the students 1) fundamentals of solar radiation 2) Estimation of solar energy available. 3) Design and fabrication of solar thermal systems 4) Analyze the solar thermal system 5) Design a solar PV system.			
POs	a, b, c, d, g, h, i, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title			
	Author			
	Publisher			
	Edition			
Content	1. Study of Carburetors 2. Study of Fuel Injection Systems 3. Study of Engine Components 4. Performance Characteristics of C.I. Engine 5. Performance Characteristics of C.I. Engine 6. Experiment on Air Pollution			

Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: MEL 432	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Computer Graphics & Solid Modeling**			
Course Coordinator	**R. V. Uddanwadikar**			
Course Objectives :	**Objectives :** 1. To understand the concept of graphics 2. To expertise the modelling technique 3. To simulate all the engineering parts.			
POs	a, b, c, e, h, i			
Semester	Odd: **Yes**		Even: No	

	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books	Title	Interactive Computer Graphics
	Author	Edward Angel
2.	Title	Computer Graphics C version
	Author	Hearn and Baker
2.	Title	Computer Graphics
	Publisher	ISRD Group The McGraw Hill Companies

Content	Introduction to Computer Graphics, Application of Graphics, Graphic devices, display systems, refresh CRT, Raster scan and random scan, color monitors, VGA, flat panel display, LED and LCD, input and output devices. Graphical User Interface, Introduction, Types of GUI, widgets, components, Design of GUI, User centered design, Event driven programming, Principles of good GUI design. Scan conversion and output primitives, DDA algorithm, Bresenham line drawing algorithm, Bresenhem's midpoint circle and ellipse algorithm, polygon filling. Windows and clipping, windows and Viewport, clipping, point clipping, line clipping, Sutherland cohen subdivision line clipping algorithm, Midpoint subdivision algorithm. 2D and 3D transformations, geometric transformation using homogenous matrix method, translation, rotation, scaling, reflection, and shearing. Successive transformation and composite transformation. Solid Modeling vs. surface modeling, Types of representation, spatial enumeration, cell decomposition, boundary representation, sweep representation, primitive instancing, constructive solid geometry, Advanced modeling techniques, procedural modeling, Multi-particle rendering, Volume rendering, Grammar based system. Curves, curves representation, parametric and non parametric form, properties of curve representation, interpolation and approximation, Blending functions, 3d Space curves, Spline, cubic Spline, B-spline, Bezier curves, properties of Bezier curves, Hermite curves, comparison of curves, 3D surfaces, Super-quadric surfaces, blobby objects.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP 432**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Computer Graphics & Solid Modeling Lab.**			
Course Coordinator	**R. V. Uddanwadikar**			
Course Objectives :	1) To impart practical knowledge in the field of solid modelling 2) To understand various algorithms used in GUI			
POs	a, b, c, e, h, i			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title			
	Author			
	Publisher			
	Edition			
Content	Based on syllabus Computer Graphics & Solid Modeling Lab.			
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%			

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL435**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**CFD**			
Course Coordinator	**V. R. Kalamkar**			
Course Objectives :	**Objectives** : 1. To develop an understanding for the major theories, approaches and methodologies used in CFD; 2. To build up the skills in the actual implementation of CFD methods (e.g. boundary conditions, turbulence modelling etc.) in using commercial CFD codes; 3. To gain experience in the application of CFD analysis to real engineering designs.			
POs	a, b, c, d, e, h, i			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**--**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Computational Methods for fluid Dynamics;
	Author	Ferziger J. H., Springer P.M
	Publisher	Verlag Berling
2.	Title	Computational fluid Dynamics;.,
	Author	Anderson J. D. JR
	Publisher	Mc Graw Hill Inc
	Edition	1995
3.	Title	Numerical Heat Transfer & Fluid flow
	Author	Patankar S. P
	Publisher	
	Edition	
4.	Title	Computational Fluid Flow and Heat Transfer,.;
	Author	Sunderarajan M.K.
	Publisher	Narosa Publishing
	Edition	2nd Ed

Content

Equations of fluid dynamics
Basic concepts Eulerarian and Lagrangian methods of describing fluid flow motion, acceleration and deformation of fluid particle, vorticity. Laws governing fluid motion, continuity, Navier – stokes & energy equations. Boundary layer equation, Euler equations, potential flow equations, Bernoulli's equation and vorticity transport equation.Initial and boundary conditions. Classification of equation of motions – hyperbolic, parabolic, elliptic.

Mathematical Preliminaries
Numerical integration. Review of linear algebra, solution of simultanilus linear algebric equations – matrix inversion, solvers – direct methods, elimination methods, ill conditioned systems; Gauss- Sidel method, successive over relaxation method.

Grid Generation
Transformation of coordinates.General principles of grid generation – structured girids in two and three dimensions, algebric grid generation, differential equations based grid generation; Elliptic grid generation, algorithm, Grid cluistering, Grid refinement, Adaptive grids, Moving grids. Algorithms, CAD interfaces to grid generation. Techniques for complex and large problems: Multi block methods.

Finite difference discretisation
Elementary finite difference coefficients, basic aspects of finite difference equations, consistency, explicit and implicit methods, errors and stability analysis. Stability of elliptic and hyperbolic equations. Fundamentals of fluid flow modeling-conservative property, upwind scheme, transporting property, higher order upwinding. Finite difference applications in heat transfer – conduction,

	convection. **Finite Volume Method** Introduction, Application of FVM in diffusion and convection problems, NS equations – staggered grid, collocated grid, SIMPLE algorithm. Solution of discretised equations using TDMA.Finite volume methods for unsteady problems – explicit schemes, implicit schemes. Finite Element Method: Introduction. Weighted residual and variational formulations. Interpolation in one-dimensional and two-dimensional cases. Application of FEM to ID and 2D problems in fluid flow and heat transfer.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL - 425** (for M.Tech. Industrial Engg + B.Tech. (7th Sem)	Open course (Y/N)	HM Course (Y/N)	Discontinued (Y/N)
	N	N	N
Course Title	RELIABILITY AND MAINTENANCE ENGINEERING		
Course Coordinator	**Prasad V. Kane**		
Course Objectives :	To train the students to work as teams to comprehend, analyze, design and create innovative solutions of real life problems. Equip the graduate to plan, design, and execute effective maintenance strategy and maintenance practices in various types of industries and apply various RCM based tools to analyse and prioritise various defects. Equip graduates with the state of the art condition monitoring technologies and instrumentation. Equip graduates with the essentials reliability theory and engineering to enable them to develop and enhance reliability programs.		
POs	a, c, d, e, f, g, h, i, j		
Semester	Odd: **Yes**		Even: No

	Lecture	Tutorial	Practical	Credits
	3	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Industrial Maintenance Management:
	Author	Srivastava S K ;
	Publisher	S. Chand
	Edition	1998
2.	Title	Reliability Enginering
	Author	L.S. Srinath
	Publisher	Affilated East-West Press P 1.td
	Edition	4th Edition 2005
3.	Title	Maintenance engineering hand hook
	Author	Higgins L.T.
	Publisher	Mc. Graw Hill Inc
	Edition	1995

Content	**Introduction to reliability and maintainability:** Engineering reliability definition. reliability assurance. reliability through redundancy, maintainability, maintainability improvement. maintainability vis-à-vis **Maintenance techniques and defect failure analysis:** dismantling and

	assembling, inspection and adjustment, lubrication. maintenance cleaning, Welding. metal spraying, metal stitching Defect recording and failure analysis. downtime analysis, breakdown analysis (FTA, FMEA). 113 **Maintenance types/systems and Condition monitoring:** planned/unplanned maintenance, breakdown, corrective. Opportunistic, routine, preventive, predictive maintenance: condition based maintenance system, design-out maintenance, selection of maintenance system, online/offline monitoring, visual, temperature, leakage, vibration, monitoring. ferrography, spectography, cracks, corrosion, noise/sound, smell/odour monitoring. condition monitoring of lutes and hydraulic systems and cross country pipe lines. **Maintenance planning and scheduling:** job planning. job manuals, long term and short term plans, overhauls and renovation. corporate turn around planning Codification and cataloguing, history cards, instruction and operation manuals, maintenance work order and work permit, maintenance record and documentation benefits, procedure and steps. **Reliability based maintenance**: evaluation of RBM programme, mean !allure rate. MTTF. MTBF. MTBS, MTBM. MTTR. Hazard models; weibull model, constant hazard. linearly increasing hazard. System reliability; logic diagrams, markov models, use of Boolean algebra, de Morgan's theorem. **Reliability in design and manufacture:** Design analysis methods, QFD, LSA, FMECA, HAZOPS, part, materials and process (PMP) review. Production Failure Analysis and Corrective Action System (FRACAS). software reliability and analysis methods. reliability management and quality management- approaches.
Course Assessment	**Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10%** **End Semester Exam : 60%**

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL439**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Product Design & Development**			
Course Coordinator	**A. M. Kuthe**			
Course Objectives :	• To understand the relationship of art and science to design • To develop proficiency in design skills and methodologies • To gain first-hand experience of the design process in the context of a 'real', open-ended multidisciplinary design project • To work effectively and professionally in a team while executing a design project • To apply engineering analysis tools in the design process • To understand the holistic context of design, including global, societal, ethical, economic and environmental concerns • To improve proficiency in professional communication skills			
POs	b, c, d, f, g, h, i, j			
lot in which offered. If not offered write N	Odd: **Yes**		Even: No	

	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books	Title	Product Design & Manufacturing		
	Author	Chitale, Gupta		

	Publisher	Prentice Hall of India
	Edition	2nd Ed 2002
Content	**Definition of Product Design** Design by Evolution, Design by Innovation, Essential Factors of Product Design, Production-Consumption Cycle. **Product Design Practice and Industry** Introduction, Product Strategies, Time to Market, Analysis of the Product, The Three S's Standardization, Renard Series (Preferred Numbers) Simplification, The Designer and His Role, The Designer: Myth and Reality, The Industrial Design Organization, Basic Design Considerations, Problems faced by Industrial Designer, Procedure adopted by Industrial Designers, Types of Models designed by Industrial Designers What the Designer contributes, Role of Aesthetics in' Product Design, Functional Design Practice. **Economic Factors Influencing Design** Product Value, Design for Safety, Reliability and Environmental Considerations Manufacturing Operations in relation to Design, Economic Analysis, Profit and Competitiveness, Break-even Analysis, Economics of a New Product Design (Samuel Eilon Model). **Human Engineering Considerations in Product Design** Introduction, Human Being as Applicator of. Forces, Anthropometrics: Man as Occupant of Space The Design of Controls, The Design of Displays, Man/Machine Information Exchange.	
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%	

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL-418**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Adv. Stress Analysis**			
Course Coordinator	**P. M. Padole**			
Course Objectives :	**Objectives** : The objective of this course is to provide students the tools required for design and analysis of complex problems in mechanics of materials.			
POs	a, b,c, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Theory of Elasticity Auckland,
	Author	Timoshnko, Goodiar
	Publisher	McGraw Hill Book Co.,
	Edition	3rd Ed 1970
2.	Title	Experimental Stress Analysis,Singapore,
	Author	Dalley, Rille
	Publisher	McGraw Hill Book Co.
	Edition	3rd Ed 1991
3.	Title	Experimental Stress Analysis,
	Author	Dove, Adams
	Publisher	Prentice Hall of India
	Edition	1965

Content	Fundamentals of stress and strain, stress strain relationship, Elastic constant, plane stress, plane strain. Stress analysis for two-dimensional problems in Cartesian coordinate system, differential equations of equilibrium. Boundary conditions, compatibility equation, Airy's stress function. Two dimensional problems in polar coordinate systems, general equations in polar coordinate systems, general equations in polar coordinates, stress distribution about systematic axis. Pure bending of curved beams, effect of hole on stress distribution in plates. Thermal stress, circular disc, thin plate, long cylinder. Photo elasticity Introduction, polarized light, wave plates, plane and circular poloriscope, Isochromatic & isoclinic fringes, compensation techniques, separation techniques, analysis of fringe patterns. Introduction to 3-D photo elasticity. Strain Gauge techniques, strain gauge circuit, recording instruments, analysis of data, strain rosette. Brittle coating technique, coating stress, failure theories, crack patterns, crack detection, Moire fringe techniques.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: MEL-428	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	Machine Tool Design			
Course Coordinator	**A. B. Andhare**			
Course Objectives :	The students will be able to apply knowledge of basic mechanical engineering for design of various machine tools & their sub systems. They will be able to analyze the vibrations in machine tools, They will be able to perform testing of machine tools.			
POs	a, b, c, e, f, h, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books **1.**	Title	Machine Tool design and Numerical Control",l, New Delhi,.
	Author	Mehta N. K
	Publisher	Tata McGraw Hill
	Edition	6th Edition 2006
2.	Title	Fundamentals of Machining and Machine Tools", ,
	Author	Boothroyd G. and Knight W. A
	Publisher	CRC Press, Taylor and Francis, New Delhi,.
	Edition	3rd Edition 2006
3.	Title	Machine Tool Design ", ,
	Author	Nicholas Lisitsyn, Alexis V. Kudryashov and Oleg Trifonov
	Publisher	University Press of the Pacific,
	Edition	Paperback 4th Edition 2000.
4.	Title	A Text Book of Production Technology – Vol. II", , , New Delhi,
	Author	Khanna O. P. and Lal M
	Publisher	Dhanpat Rai Publications
	Edition	13th Reprint 2012.
5.	Title	A Text Book of Production Engineering
	Author	Jain K. C. and Chitale A. K.
	Publisher	Prentice Hall India, New Delhi,.
	Edition	2010
6.	Title	Machine Tool Design Handbook, ,.
	Author	Central Machine Tool Institute
	Publisher	Tata Mcgraw Hill, New Delhi
	Edition	1st Edition
7.	Title	IS: 2063 – 1962, Code for Testing Machine Tools
	Author	--
	Publisher	Indian Standards Institution
	Edition	August 1962

8.	Title	Testing Machine Tools
	Author	Schlesinger G.
	Publisher	The Machinery Publishing Company, London,.
	Edition	1945
Content	Principles of machine tool design, Design of machine tool structures, Regulation of speeds and feeds. Design of speed, feed and spindle drives / gearboxes. Design of spindles and spindle supports, Design of Guide ways, Machine tool dynamics and vibration behavior, Control systems in machine tools, Testing of machine tools.	
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%	

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL-411**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	Energy Management			
Course Coordinator	**R. V. Uddanwadikar**			
Course Objectives :	On completing the course, you should have a good knowledge of how economic analysis can help understand problems related to energy; be able to analyse alternative energy policy options in terms of benefits and costs; have a good understanding of world energy markets; and be able to analyse the risks associated with energy options. You will have acquired the skills needed to structure, analyse and evaluate energy-related problems.			
POs	a, c, d, g, h, i, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Energy Management Handbook;,
	Author	Turker W. C.
	Publisher	The Fairmont Press Lilburn
	Edition	1993
2.	Title	Industrial Energy Management & Utilization;
	Author	Witte, Schmidt, Brown
	Publisher	Hemisphere Publications
	Edition	
3.	Title	The efficient use of Energy;.
	Author	Dryden
	Publisher	Butter worth, London
	Edition	1982
4.	Title	Energy Management Handbook;
	Author	Turner W. C.
	Publisher	Wiley, New York,
	Edition	1982
5.	Title	Energy Management
	Author	Murphy W.R., Mckay G., Synder William T
	Publisher	Buterworth-Heinemann
	Edition	1st Ed 2001

Content

Introduction: Importance of energy management, Energy auditing, methodology, analysis of past trends (plant data), closing the energy balance, laws of thermodynamics, measurements, portable and online instruments. Energy Economics: discount rate, payback period, internal rate of return, life cycle costing

Thermal & Mechanical systems: Boiler efficiency testing, excess air control, steam distribution and use of steam traps, condensate recovery, flash steam utilization, thermal insulation. Energy conservation in pumps, fan (flow control), Compressed air systems, Refrigeration and air conditioning systems.

Electrical Systems: demand control, power factor correction, load scheduling / shifting, motor drives-motor efficiency testing, energy efficient motors, and motor speed control.
Lighting: Lighting levels, efficient options, fixtures day lighting, timers, and energy efficient windows.
Waste heat recovery: Recuperators, heat wheels, heat pipes, heat pumps. Cogeneration concept, options (steam / gas turbines / diesel engine based). Demand side management.

	Energy Auditing: Introduction, importance of energy audit, uses of energy audit basic terms of energy audit, types of energy audit, procedure for carrying energy audit, instruments used for energy audit
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL401**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	Y
Type of course				
Course Title	**Control System**			
Course Coordinator	**A. Chatterjee**			
Course Objectives :	**Objectives** : 1. To teach the fundamental concepts of Control Systems and mathematical modelling of the system, 2. To study the concept of time response and frequency response of the system, 3. To teach the basics of stability analysis of the system.			
POs	a, b, c, d, e, h, i, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title	Control system Engineering		
	Author	Nise		
	Publisher	Wiley		
	Edition	1995		
2.	Title	Modern control system		
	Author	Dorf		
	Publisher	Addison Wesley		
	Edition	8th Ed 1999		
3.	Title	Digital control system		
	Author	Gopal		
	Publisher	Tata McGraw Hill, New Delhi		
	Edition	1st Ed		
Reference Books	Title	Modern Control Engineering		
	Author	K. Ogata		
	Publisher	Prentice Hall of India		
	Edition	Third		

Content

Principal of feedback control

Types of control system and error constants. Performance characterization of second and higher order systems through transient response. Effect of additional zero and pole. Introduction to design and compensation.

Compensator design

Compensator design using root locus plot. Cascade lag compensation, cascade lead compensation. Lag-lead compensation. Root locus of system with dead time and sensitivity analysis. Compensator design using Bode plots.

Controllers

PID controllers Pneumatic valves, actuator and controllers. Hydraulic actuators and servo mechanisms. DC Servo motor and stepper motors. Control through operational amplifiers.

Control Systems

State variable, modeling of control system. Conversion of state variable model to transfer function and vice versa. Solution of state equations. State transition matrix. Concepts of controllability and

	observability. **Introduction to digital control systems** Sample data systems, Z transform of discrete signals. Performance of a sample data second order system. Root locus of digital control systems. Stability analysis in the Z plane. **Introduction to control system on MATLAB platform** Introduction to control system on MATLAB platform. MATLAB commands and control system toolbox. Analysis of transient response of control system through MATLAB commands. Root locus and BODE plot on MATLAB figure window. Simulation of digital control system using MATLAB.
Course Assessment	Sessional – II : 15%, Sessional –I I : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL403**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Operation Research**			
Course Coordinator	**Y. M. Puri**			
Course Objectives :	1. To study the various OR tools, 2. Study to apply a appropriate model to the given situatuation. 3. Formulate the problem 4. solve and analyse the problem			
POs	b, e			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books	Title	Operation Research,.		
1.	Author	Heera, Gupta		
	Publisher	S. Chand &Co		
	Edition	3rd Ed		
2.	Title	Operation Research		
	Author	Sharma J.K		
	Publisher	Macmillan India Ltd.		
	Edition	2nd Ed		
3.	Title	Quantitative Techniques in Management;,		
	Author	Vohra N D		
	Publisher	Tata Mc Graw Hill		
	Edition	1995		
4.	Title	Introduction to Operation Research;.,		
	Author	Liberman G. J		
	Publisher	Mc Graw Hill Book Co		
	Edition	1989		

Content	Introduction to OR& basic OR models, definition, characteristics and limitations of OR, linear programming: solutions of LPP by graphical method and simplex method, formulation of dual of LPP. Assignment model, travelling salesman problem by, Transportation Problems, transhipment model. . Dynamic programming, structure and characteristics of dynamic programming, application of dynamic programming to resource allocation, inventory control & linear programming. Project management: drawing of network, CPM & PERT, Probability of completion of project, cost analysis of project, allocation and updating of networks. . Replacement models: concept of equivalent, interest rate, present worth, economic evaluation of alternatives, group replacement models. Inventory control models, analysis of single product deterministic models. Waiting line situations, queuing theory and models (no derivations expected). Simulation concept and its application in waiting line situations, inventory and networks
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL422**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Automobile Engineering**			
Course Coordinator	**A. S. Dhoble**			
Course Objectives :	**Objectives** : 1. To understand various systems in vehicle, 2. To gain knowledge regarding maintenance and testing of vehicle.			
POs	a, b, c, e, f, h, j, k			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Automobile Engineering-Vol. Vol. II,.;
	Author	Singh K
	Publisher	Standard pub. & Distributors,
	Edition	9th Ed 2003
2.	Title	Automobile Engineering;, Chennai,
	Author	Ramalingum K.K
	Publisher	Scitech Publications
	Edition	2001
3.	Title	Automotive Engines
	Author	Srinivasan S.
	Publisher	Tata Mc Graw Hill
	Edition	1985
4.	Title	Automotive Mechanics;,
	Author	Crouse W.H
	Publisher	Tata Mc Graw Hill
	Edition	2002

Content

Introduction

Automobile history and development Present scenario of automobiles in India and Abroad. Chassis, articulated and rigid vehicles and vehicles layout. Prime movers. I. C. Engines, Gas turbines, Wankel engine, Engine construction - Structural components and materials Review of fuel, cooling and lubrication systems Filters, water pumps, radiators, Thermostats, ant freezing Compounds.

Steering & Suspension Systems

Steering systems, principle of steering, center point steering, Steering linkages, steering geometry and wheel alignment, power Steering, special steering systems. Tyres, tyres specification, factors affecting tyre performance, Special tyres, wheel balancing, suspension system- Function of Spring and shock absorber, conventional and Independent suspension System, Telescopic shock absorber, linked suspension systems,

Transmission Systems

Clutch - Necessity, requirements of a clutch system. Types of Clutches, size of clutch, centrifugal clutch, wet clutch, fluid Clutch. Transmission, Necessity of transmission, principle, types of transmission, Sliding mesh, constant mesh, synchromesh, Transfer gear box, Gear Selector mechanism, lubrication and control. Overdrive, Torque Converter, Automatic Transmission.

Propeller shaft, Universal joint, constant velocity joint, Hotchkiss drive, and torque tube drive.

	Differential - Need and types Rear Axles and Front Axles. **Brakes** Need, types Mechanical, hydraulic, Pneumatic brakes, Electrical Brakes, Engine Exhaust brakes, Drum and Disc brakes, Comparison. Details of components, Brake adjustment. **Electrical systems** Construction. Operation and maintenance of Lead acid batteries, battery charging system, Principles and Operation of cutout and regulators, Starter motor, Battery Ignition and magneto ignition systems ignition timing. Lighting and electrical accessories Automobile air- conditioning, Panel board instruments. **Maintenance & Testing** Maintenance, Trouble shooting and service, procedures, Overhauling, Engine tune up, Tools and equipment for repair and Overhaul. Testing equipments. Inspection, laboratory and road testing of automobiles. Safety Considerations in automobiles, Tractors, Trailers, Fun mobiles, Hybrid vehicles racing cars. Recent Advances in automobiles such as ABS, Electronic Power Steering, and Steer by wire, Traction control, Active suspension, Collision avoidance, Intelligent lighting, Navigational aids and Intelligent vehicle highway system.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP422**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Automobile Engineering Lab.**			
Course Coordinator	**A. S. Dhoble**			
Course Objectives :	**Objectives** : 1. To understand various systems in vehicle, 2. To gain knowledge regarding maintenance and testing of vehicle.			
POs	a, b, c, e, f, h, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Content	1. Study of Carburetors 2. Study of Fuel Injection Systems 3. Study of Engine Components			

	4. Performance Characteristics of C.I. Engine 5. Performance Characteristics of C.I. Engine 6. Experiment on Air Pollution
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL426**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Refrigeration & Cryogenics**			
Course Coordinator	**D. B. Zodpe**			
Course Objectives :	**Objective** : 1. To explain and demonstrate various types of equipments (compressors / condensers / evaporators, expansion devices) used in refrigeration. 2. to demonstrate through experimentation the performance related concepts for refrigerator, air condiner, heat pump etc.			
POs	a, b, c, d, e, f, h, i, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Principles of Refrigeration
	Author	Dossat Roy J
	Publisher	Pearson Education Asia Publication
	Edition	4th Ed.
2.	Title	Refrigeration and Air conditioning
	Author	Arora C.P
	Publisher	Tata Mc Graw Hill Publication
	Edition	2nd Ed
3.	Title	Refrigeration and Air conditioning
	Author	Ballaney P.L
	Publisher	Khanna publishers
	Edition	
4.	Title	Refrigeration and Air conditioning
	Author	Prasad Manohar
	Publisher	New edge Publication
	Edition	2nd Ed
5.	Title	Refrigeration and Air conditioning,;
	Author	Khurmi R.S
	Publisher	Eurasia publishing house
	Edition	3rd Ed
6.	Title	A course in Ref. &Air Conditioning,.;
	Author	Arora, Domkundwar
	Publisher	Dhanpat Rai Publications.
	Edition	7th Ed
7.	Title	Air conditioning principles and systems,.;
	Author	Pita Edward G
	Publisher	Prentice Hall
	Edition	4th Ed
8.	Title	ASHRAE handbook and
	Author	
	Publisher	CARRIER hand book
	Edition	

Content	Vapor Compression Refrigeration system Introduction to refrigeration, applications of refrigeration, development of simple saturated Vapour compression refrigeration cycle, effect of change in evaporator and condenser pressure, effect of pressure drops, polytropic compression, methods of improvement in the performance of the cycle like sub cooling, superheating, use of heat exchanger, flash chamber and flash inter-cooler. Components of Vapor compression system Classification, construction and application of various components like compressors, condensers, evaporators, expansion devices, controls, cooling towers etc Refrigerants Types and classification, properties and nomenclature, Azeotropes, and environment friendly refrigerants. Other refrigeration systems Vapor absorption systems (NH3- H20, LiBr- H2O) steam jet refrigeration systems, thermoelectric refrigeration, vortex tube refrigeration. Multistage Refrigeration systems Working and analysis of multistage systems multiple evaporator and multiple compressor systems. Gas cycle refrigeration Gas cycle refrigeration, reversed Brayton /Joules/Bell Coleman cycle, aircraft refrigeration, simple cycle, boot strap cycle, reduced ambient cycle regenerative cycle, Sterling cycle refrigeration. Cryogenics Introduction and applications of cryogenics, cascade refrigeration, Joules Thomson effect, methods of air liquification, Linde's and Claude's cycle, adiabatic demagnetization, cryogenic insulation.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP 426**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Refrigeration & Cryogenics Lab.**			
Course Coordinator	**D. B. Zodpe**			
Course Objectives :	**Objectives** : The objective of the refrigeration and cryogenics engineering is to train the students for whole roles such as moral, intellectual and physical education, to make them talent in the design, research, tutor and management of the refrigeration and air conditioning technology.			
POs	a, b, c, d, e, f, h, i, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Content	Practical based on Syllabus of			

Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL420**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N		Y
Type of course				
Course Title	**Finite Element Method**			
Course Coordinator	**P. M. Padole**			
Course Objectives :	**Objectives** : 1. Equip the students with the Finite Element Analysis fundamentals, 2. Enable the students to formulate the design problems into FEA, 3. Enable the students to perform engineering simulations using Finite Element Analysis software (ANSYS & LSDYNA). 4. Enable the students to understand the ethical issues related to the utilization of FEA in the industry. .			
POs	a, c, d, j			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title	Concepts and application in Finite Element Analysis		
	Author	Cook R.D		
	Publisher	The Wiley & Sons		
	Edition	3rd Ed		
2.	Title	Introduction to Finite Element Engineering,.;		
	Author	Chandragupta, Bellegundu		
	Publisher	Prentice Hall		
	Edition	2nd Ed		
3.	Title	Finite Element Analysis,.;		
	Author	Krishnamurthy		
	Publisher	Tata Mc Graw Hill		
	Edition	2nd Ed		
4.	Title	Finite Element Procedure,.;		
	Author	Bathe		
	Publisher	Prentice Hall of India		
	Edition	3rd Ed		

Content	Introduction to variational methods in boundary value problems. Rayleigh-Ritz method. Concept of finite elements. Brief introduction to finite analysis. Discretisation, approximation and assembly of finite elements, Strain-displacement and stress-strain relations for plain-stress, plain-strain and axismmetric problems. Temperature effect. Finite element modeling of 1-D problems. Langranian and Hermitian shape functions, element stiffness matrix and load vector. Assembly of global stiffness matrix and global load vector. Boundary constraints and solution for nodal displacements. Convergence criteria and compatibility requirement. Higher order elements. Weak formulation, Gelerkin FEM and non-linear problems. Eigen value problems of 1-D models, vibration of bars. 2-D problems with constant strain triangles. Co-ordinate transformation and Jacobian. Straight sided and curved sided elements. Gauss-quadrature integration formula. Beam flexure modeling with finite elements. Vibration of beams. Plate bending problem with triangular, rectangular, and curve sided elements. Types of curve sided elements. Triangular and rectangular isoperimetric elements. Sub parametric and super parametric elements. Finite element modeling of incompressible inviscid fluid flows and steady state heat conduction problem.
Course	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10%

Assessment	End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP420**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N		Y
Type of course				
Course Title	**Finite Element Method Lab.**			
Course Coordinator	**P. M. Padole**			
Course Objectives :	• Equip the students with the Finite Element Analysis fundamentals, • Enable the students to formulate the design problems into FEA, • Enable the students to perform engineering simulations using Finite Element Analysis software (ANSYS & LSDYNA). • Enable the students to understand the ethical issues related to the utilization of FEA in the industry.			
POs	a, c, d, j			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Concepts and application in Finite Element Analysis
	Author	Cook R.D
	Publisher	The Wiley & Sons
	Edition	3rd Ed
2.	Title	Introduction to Finite Element Engineering,.;
	Author	Chandragupta, Bellegundu
	Publisher	Prentice Hall
	Edition	2nd Ed
3.	Title	Finite Element Analysis,.;
	Author	Krishnamurthy
	Publisher	Tata Mc Graw Hill
	Edition	2nd Ed
4.	Title	Finite Element Procedure,.;
	Author	Bathe
	Publisher	Prentice Hall of India
	Edition	3rd Ed

Content	Practical based on the syllabus.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL441**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**CDBM : COMPUTERS AND DATABASE MANAGEMENT**			
Course Coordinator	**A. M. Kuthe**			
Course Objectives :	Students successfully completing this course should be able to : 1. To understand the different issues involved in the design and implementation of a database system. 2. to study the physical and logical database designs, database modelling, relational, hierachical, and network models, 3. to understand and use data manipulation language to query, update, and manage a database, 4. to develop an understanding of essential DBMS concepts such as: database security, integraty, concurrency, distributed database, and intelligent database, client/server, data warehousing.			
POs	a, c, d, e, i, j			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	A Profile of Information Technology-Computer Digest
	Author	Banerjee H.R.
	Publisher	Jaico Publication
2.	Title	Management Information System,
	Author	Devis Gordon B.,Olson M.H
	Publisher	TMH
	Edition	2nd Ed.
3.	Title	Fundamental of database System
	Author	Elmarsi R., Navathe S.B.
	Publisher	Pearson Education Asia
4.	Title	Managing with Information
	Author	Kanter Jerome
	Publisher	Prentice Hall of India
	Edition	2nd Ed 1994
5.	Title	Computer Fundamental: Concept, Systems and Applications
	Author	Sinha P.K
6.	Title	Database Management System
	Author	Panneerselvan R
	Publisher	Prentice Hall of India Pvt. Ltd.
	Edition	2002

Content

Introduction
Various types of Hardware and Software in common use as applicable to information technology. The different Hardware applications architectures available e.g. Centralized, Distributed, client server. Concept of general system theory and their applications to information system.
Data Design & Architecture
Designing data and information architecture to assist and improves planning decision, making and control.
MIS
Use of information / data for decision making at the various level of the organization and components of the information system which can support those decision i.e. transaction processing system, management information system etc. Cost benefit analysis of I.T.
DBMS
Different methods of data collections. Electronic commerce and its impact on business strategy.

	Use of database and planning modules in strategic planing process e.g. external database economic models, forecasting modeling package strategy of information development and management on organization structure. Data Security Safety of data, evaluation of database system to avoid fraud. RDBMS Use of ERP and relational database management system
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEP442**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**COMPUTERS & DATABASE MANAGEMENT LAB (CDBM Lab.)**			
Course Coordinator	**A. M. Kuthe**			
Course Objectives :	Students successfully completing this course should be able to : 1. To understand the different issues involved in the design and implementation of a database system. 2. to study the physical and logical database designs, database modelling, relational, hierarchical, and network models, 3. to understand and use data manipulation language to query, update, and manage a database, 4. to develop an understanding of essential DBMS concepts such as: database security, integraty, concurrency, distributed database, and intelligent database, client/server, data warehousing.			
POs	a, c, d, e, i, j			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Content	1. Development of software for file handling system. 2. Development of programs using simple SQL commands. 3. Use of DDL commands on Computer (MS-SQL) 4. Use of DML commands 5. Development of database management system for any Industrial application 6. Specific application system progress for detail study. 7. Development of any practical oriented system as applicable in industry.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL444**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Solar Energy Utilization**			
Course Coordinator	**A. K. Singh**			
Course Objectives :	**Objectives** : Introduce to the students 1) fundamentals of solar radiation 2) Estimation of solar energy available. 3) Design and fabrication of solar thermal systems 4) Analyze the solar thermal system 5) Design a solar PV system.			
POs	a, b, c, d, e, g, h, i, j, k			
Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**2**	**08**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title	Solar energy,		
	Author	Sukhatme S.P		
	Publisher	Tata McGraw Hill		
	Edition	2nd Ed 2003		
2.	Title	Solar energy		
	Author	Duffie, Beckman		
	Publisher	John Wiley & Sons		
	Edition	1974		
3.	Title	Energy technology, 1995		
	Author	Parulekar B.B., Rao S		
	Publisher	Khanna Publishers		
	Edition	3rd Ed		
4.	Title	Non Conventional energy sources,.;.		
	Author	Rai G.D		
	Publisher	Khanna Publishers		
	Edition	3rd Ed 1995		
5.	Title	Solar Energy – Fundamentals & Applications;,		
	Author	Garg H. P., Prakash J		
	Publisher	TMH		
	Edition	1997		
Content	**Solar Thermal systems** Liquid Flat – Plate collector, air heater and concentrating collector, Solar pond, Solar distillation, Solar drying. Thermal storage. **Analysis** Modeling of above systems, Steady state and transient analysis, simulation in process design. **Design** Design of active systems by f-chart and utilizability methods. **Passive heating and cooling of Buildings.**			
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%			

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL413**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Fracture Mechanics**			
Course Coordinator	**V. M. Nistane**			
Course Objectives :	The course will treat linear and nonlinear fracture mechanics principles and their applications to mechanical and structural design. Fracture phenomena in metals and non-metals will be discussed and testing methods will be highlighted. In the end computer assisted techniques for fracture study will be discussed.			
POs	a, b, c, d, e, f, g, h			

Semester	Odd: **No**		Even: **Yes**	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**3**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books **1.**	Title	Fracture Mechanics: An Introduction”,.,
	Author	Gdoutos, E.E
	Publisher	Springer.
	Edition	2nd Ed , 2005
2.	Title	Elementary Engineering Fracture Mechanics”,.,
	Author	Broek, D.
	Publisher	Springer
	Edition	3rd Ed 1982
3.	Title	Elements of Fracture Mechanics”,
	Author	Kumar, P
	Publisher	Wheeler Publishing
	Edition	1999
4.	Title	Fracture Mechanics: Fundamentals and Applications
	Author	Anderson, T.L
	Publisher	CRC Press
	Edition	3rd Ed 2005
5.	Title	.Practical Fracture Mechanics in Design”,.,
	Author	Shukla, A
	Publisher	CRC Press.
	Edition	2nd Ed 1989
6.	Title	Stability of Structures: Elastic, Inelastic, Fracture and Damage Theories”,
	Author	Zdenek P. Bazant and luigi Cedoliin
	Publisher	World Scientific Publishers.
	Edition	2010

Content	Introduction to Fracture Mechanics: Introduction to the realm of fracture and back ground history of development of fracture mechanics; Discrepancy between theoretical and real strength of materials, conventional failure criteria based on stress concentration and characteristic brittle failures, Griffith’s work. Linear Elastic Fracture Mechanics (LEFM): Crack deformation modes and basic concepts, crack tip stresses and deformation, Stress Intensity Factor (SIF) and its criticality in different modes, superposition of SIFs, LEFM design concept applications; Concept of energy release rate, equivalence of energy release rate and SIF. Fracture toughness and its laboratory determination procedure, test specimen size requirement etc.; Effect of temperature and loading rate on fracture toughness; Fatigue and fatigue crack propagation laws, fatigue life calculations under constant and variable amplitude loading, mixed-mode fatigue crack propagation

	Elastic Plastic Fracture Mechanics (EPFM): Design criteria for non-brittle materials; plastic zone corrections, crack opening displacement (COD), J-contour integral and crack growth resistance (R-curve) concepts.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 445**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Air Pollution Control**			
Course Coordinator	**J. G. Suryawanshi**			
Course Objectives :	Introduce to the students fundamentals of solar radiation Estimation of solar energy available. Design and fabrication of solar thermal systems Analyze the solar thermal system Design a solar PV system.			
POs	b, c, j			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Rao; Air Pollution,.:,
	Author	2001
	Publisher	Tata Mc Graw Hill
	Edition	7th Ed
2.	Title	IC Engines and Air Pollution, ,
	Author	Obert E.F.
	Publisher	Harper & Row Pub.
	Edition	1979
3.	Title	Automotive Pollution Control;.,
	Author	Reston
	Publisher	Reston Pub Co
	Edition	1984
4.	Title	Air Pollution Monitoring and Control;, , ND, 2001
	Author	Prabhakar V.K
	Publisher	Anmol Prakashan
	Edition	1st Ed

Content	**Introduction** Conventional energy conversion methods using fossil fuels. Their environmental aspects, Pollution from the thermal power plants, thermal and particulate pollution and its control. **IC Engines** Combustion in petrol and diesel engines. Emissions from I.C. Engines and its control. Primary and Secondary Pollutants. Use of various alternative fuels, additives and their effect on pollution. Conventional and microprocessor based control of Air/Fuel ratio, ignition and injection timing, speed and emissions from I.C.Engines. **Noise pollution** Noise pollution and noise control. Standardization for environmental control pollution.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: **MEL 447**	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	
Type of course				
Course Title	**Advanced Turbo machinery**			
Course Coordinator	**V. R. Kalamkar**			
Course Objectives :	**Objectives** : The course aims at giving an overview of different types of turbomachinery used for energy transformation, such as pumps, fans, compressors, as well as hydraulic, steam and gas-urbines. It will focus on applications in power generation, transport, refrigeration and the built environment.			
POs	a, b, c, d, e,h, i			

Semester	Odd: **Yes**		Even: No	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	NIL			
Prerequisite credits	200			
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			

Text Books 1.	Title	Compressors and Fans
	Author	Yahya, S.H., Turbines
	Publisher	Tata McGraw-Hill Publishing Company
	Edition	1996
2.	Title	Hand book of Turbomachinery,.,
	Author	Earl Logan, Jr.,
	Publisher	Marcel Dekker Inc
	Edition	1992
3.	Title	Fluid Mechanics and Thermodynamics of Turbomachinery,.
	Author	Dixon, S.I.
	Publisher	Pergamon Press,
	Edition	1990
4.	Title	Principles of Turbomachinery,
	Author	Shepherd, D.G.
	Publisher	Macmillan
	Edition	1969.
5.	Title	Blowers and Pumps,
	Author	Stepanpff, A.J.,
	Publisher	John Wiley and Sons Inc.
	Edition	1965
6.	Title	Gas Turbines,. Co.
	Author	Ganesan, V
	Publisher	Tata McGraw Hill Pub
7.	Edition	1999
	Title	Fluid Dynamics and Heat Transfer of Turbo-machinery,
	Author	B. Lakshminarayana
	Publisher	John Wiley & Sons, Inc.

Content	Principles of Turbomachinery: Energy transfer between fluid and rotor, classification of fluid machinery, dimensionless parameters, specific speed, applications, stage velocity triangles, work and efficiency. Centrifugal fans and blowers: Types, stage and design parameters, flow analysis in impeller blades-volute and diffusers, losses, characteristic curves and selection, fan drives and fan noise. Centrifugal Compressor: Construction details, impeller flow losses, slip factor, diffuser analysis, losses and performance curves. Axial flow compressor: Stage velocity diagrams, enthalpy-entropy diagrams, stage losses and

	efficiency, work done, stage design problems and performance characteristics. Axial and radial flow turbines: Stage velocity diagrams, reaction stages, losses and coefficients, blade design principles, testing and performance characteristics. CFD for Turbo machinery, General Aspects.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%

COURSE CONTENT PROFORMA
Department: Mechanical Engineering

Course No: MEL446	Open course (Y/N)	HM Course (Y/N)	DC (Y / N)	DE (Y / N)
	N	N	N	Y
Type of course				
Course Title	**Artificial Intelligence in Manufacturing**			
Course Coordinator	**S. S. Chiddarwar**			
Course Objectives :	The main objective of this course is to make students conversant with the various machine learning artificial intelligence algorithms and their application in context with manufacturing processes. The students opting for this course will be in position to get an overview of various artificial intelligence algorithms and hands on experience to model complicated engineering problems to solve them using soft computing techniques.			
POs	a, c, d, e, i, j, k			
Semester	Odd: No		Even: Yes	
	Lecture	Tutorial	Practical	Credits
Contact Hours	**6**	**0**	**0**	**06**
Prerequisite course codes as per proposed course numbers	1. This course is for level four and five. 2. Student should have sufficient interest in mathematics and MATLAB programming. 3. Generic idea about manufacturing processes and physics behind them is desirable NIL			
Prerequisite credits				
Equivalent course codes. As per proposed course and old course	NIL			
Overlap course codes. As per proposed course numbers	NIL			
Text Books 1.	Title	Neural Networks, Fuzzy logic & G. A. Synthesis & Application		
	Author	Rajashekaran, S. and Pai, GAV		
	Publisher	PHI		
	Edition	2012 (First)		
2.	Title	Genetic Algorithms		
	Author	R. Deb		
	Publisher	Wiley		
	Edition	2010		
3.	Title	Genetic Algorithms in Search, Optimization, and Machine Learning		
	Author	David E Goldberg		
	Publisher	Pearson Education India		
4.	Title	Fuzzy Logic with Engineering Applications		
	Author	Timothy J. Ross		
	Publisher	John Wiley Publication.		
5.	Title	Neural Networks: A Classroom Approach		
	Author	Satish Kumar		
	Publisher	Tata McGraw-Hill Education		

Content

Overview of artificial intelligence : Introduction to AI, evolution of AI, application areas, advantages, limitations, future applications.

Knowledge base expert systems : Introduction, expert system components and human interfaces, expert system characteristics and features, knowledge acquisition, knowledge base, inference engine, forward chaining, backward chaining, expert system shell, explanation.

Fuzzy logic : Introduction, Sources of Uncertainty , Membership Functions and Uncertainty, type I and II fuzzy logic systems, application of fuzzy logic to manufacturing engineering problems.

Genetic algorithms : Introduction, random heuristic search, simple genetic algorithm (SGA): algebra, selection, mutation, crossover, mixing, application of SGA for solving single objective multi constraint problems.

Artificial neural networks : Introduction, supervised and unsupervised neural networks, single and multilayered neural networks, applications, advantages, drawbacks.

Introduction to Fusion of ANN, fuzzy and GA.

Case studies:

Based on total number of students opting for this course will be grouped and asked to select problems from manufacturing engineering to solve them using learned techniques.

1. Learning of expert system software like VIDWAN, CLIPS and its application to make a

	decision support system to solve manufacturing engineering problems like, selection of tool characteristics based on application, selection of manufacturing systems, fault diagnostics for vehicles and advance machines. 2. Application of fuzzy logic for selection of layered manufacturing systems, fluid flow control and temperature control systems 3. Application of GA for solving scheduling and cellular manufacturing 4. Modeling and application of ANN to manufacturing problems like optimal parameter selection for drilling, milling, EDM etc.
Course Assessment	Sessional – II : 15%, Sessional – II : 15%, Teachers Assessment : 10% End Semester Exam : 60%