

ORDINANCES, CURRICULA *and* SYLLABI

Approved in First Meeting of Board of Management held on 14-3-2014
and Academic Council on 11-6-2014



Bachelor of Technology

for

Newly Admitted Students from Session 2014-2015

**MADAN MOHAN MALAVIYA
UNIVERSITY OF TECHNOLOGY
GORAKHPUR-273010 (UP), INDIA**

CONTENTS

		Page
Section A	ORDINANCES	3
Section B	CURRICULA	20
	Civil Engineering	21
	Computer Science & Engineering	26
	Electrical Engineering	30
	Electronics & Communication Engineering	35
	Mechanical Engineering	39
Section C	SYLLABI	44
	Applied Science	45
	Civil Engineering	57
	Computer Science & Engineering	61
	Electrical Engineering	68
	Electronics & Communication Engineering	72
	Mechanical Engineering Department	75
	Open Electives	80

Section A

ORDINANCES

MADAN MOHAN MALAVIYA UNIVERSITY OF TECHNOLOGY GORAKHPUR (UP) - INDIA

First Ordinances

In pursuance of the provisions of section 31 of The Uttar Pradesh Madan Mohan Malaviya University of Technology Act, 2013, these are the first Ordinances for Madan Mohan Malaviya University of Technology, Gorakhpur:

The Uttar Pradesh Madan Mohan Malaviya University of Technology

FIRST ORDINANCES, 2014

Short title, commencement and Definitions Sec. 31 (1)

1. These Ordinances may be called the Madan Mohan Malaviya University of Technology, Gorakhpur. First Ordinances, 2014
2. They shall come into force at once.
3. Anything contained in ordinances, regulations and rules made there under in violation to provisions of Act shall be void and the provisions of Act shall prevail.
4. In these Ordinances, unless the context otherwise requires
 - (a) 'Act' means the Uttar Pradesh Madan Mohan Malaviya University of Technology Act, 2013 as amended from time to time.
 - (b) 'Section' means a section of the Act.
 - (c) 'University' means the Madan Mohan Malaviya University of Technology, Gorakhpur.
5. Words and expression used herein but not defined and defined in the Act shall have the same meaning as assigned to them in the Act.

6. UNDER SECTION 31-1(a) - The Admission of students, the courses of Study and Fees therefore, the qualifications pertaining to the award of degrees, diploma, certificates and other academic distinctions, the conditions for the grant of fellowships and awards and the like

- (a) University may start the other Degree, Diploma, Certificate programmes and other academic distinctions as deemed necessary for fulfilling its objectives and the Ordinances for the same shall be as prescribed by Academic Council and Board of Management.
- (b) Courses of Study shall be as prescribed by the Academic Council and approved by Board of Management.
- (c) Fellowships and Awards shall be instituted as per the requirement with the approval of Vice Chancellor under intimation to the Academic Council and Board of Management
- (d) Ordinances for Bachelor of Technology (B.Tech.), Master of Technology (M.Tech.), Master of Business Administration (M.B.A.), Master of Computer Applications (M.C.A.) and Doctor of Philosophy (Ph.D.) Degree programmes running in the University at the time of its reconstitution from Madan Mohan Malaviya Engineering College, Gorakhpur are detailed ahead. Ordinances for other programmes as started from time to time shall be as prescribed by the Academic Council and Board of Management.

6.1 ORDINANCES FOR B.TECH. PROGRAMMES FROM ACADEMIC SESSION 2014-15

6.1.1 ADMISSION

- (a) University offers full time B.Tech. Degree Programme in various disciplines of Engineering and Technology.
- (b) Admission to B.Tech. first year in Semester I and lateral admission in B.Tech. second year in semester III (for B.Sc. graduates/Diploma Holder candidates only) will be made as per the rules prescribed by the University from time to time.
- (c) The reservation policy as prescribed by U.P. State Government or its directions regarding admission from time to time shall be adhered in the admission.

- (d) The selection will be based on the merit of the candidate in the admission process.
- (e) Admission on migration of a candidate from any other University to Madan Mohan Malaviya University of Technology is not permitted.
- (f) If, at any time after admission, it is found that a candidate has not fulfilled all the requirements stipulated in the offer of admission or has committed some fraudulent act or gross misconduct at any stage then the University reserves the right to revoke the admission of the candidate.

6.1.2 ELIGIBILITY FOR ADMISSION

6.1.2.1 For B. Tech. First Year

- (a) The candidate should have passed 10 + 2 examination with at least 45% marks (40% in case of candidate belonging to SC/ST category) and also with atleast 50% marks (45% in case of candidate belonging to SC/ST category) in Mathematics, Physics and Chemistry each without grace.
- (b) Candidates who have passed Intermediate of U.P. Board or (10+2) standard from other recognized board with Agriculture securing minimum 50% marks or as prescribed by the University from time to time are eligible for admission to first year of 4 year B. Tech. (Agriculture Engineering).

6.1.2.2 For Admission to B. Tech. Second Year through Lateral Entry Scheme

- (a) Candidates who have passed 3/4 year Diploma with minimum 60% marks from institutions recognized by the U.P. Board of Technical Education or equivalent in any branch of Engineering/Technology except Agriculture Engineering or B.Sc. Graduates who have passed from any recognized University of the India securing minimum 60% marks with mathematics as a subject in B.Sc. and having passed 10+2 standard examination of U.P. Board or other recognized board securing minimum 50% marks in Physics & Mathematics as compulsory subjects in Intermediate of U.P. Board or from other recognized board or as prescribed by the University from time to time are eligible for admission to second year in any branch of Engineering/Technology except Agriculture Engineering.
- (b) Candidates who have passed 3/4 year Diploma with minimum 60% marks from institutions recognized by the U.P. Board of Technical Education in Agriculture Engineering are only eligible for admission to second year of Agriculture Engineering

6.1.2.3 Academic Council of the University has the power to repeal and modify the eligibility criteria for admission.

6.1.3 PROGRAMME DURATION

- (a) The duration of the B. Tech. programme for the candidates admitted in semester I will be four academic years (eight semesters).
- (b) The duration of the B. Tech. programme for the candidates admitted in semester III will be three academic years (six semesters).
- (c) The duration of each semester will generally be 90 working days or as prescribed by the University from time to time.
- (d) There are two regular semesters in a year. The semester that begins in July (*July to November/December*) is known as the *Odd Semester* and the semester that begins in December/January (*December/January to May*) is known as the *Even Semester*. Academic session may be scheduled in the summer season as well.
- (e) The maximum time allowed for completion of the programme for the candidates admitted in semester I/semester III (for diploma holders/B.Sc. Graduates) shall be six/five years respectively, beyond which the admission of the candidate shall be automatically cancelled. The candidate will not be allowed to continue in the subsequent years of the programme, if the sufficient time period is not available for its completion in stipulated maximum duration.

- (f) The student may complete the programme at a slower pace by taking more time but not more than prescribed maximum duration as per the provision of **Clause 6.1.9**.

6.1.4 CHANGE OF BRANCH

- 6.1.4.1** Change of Branch amongst the students having similar eligibility qualifications may be allowed in first year, after the last date of admission in semester I of B.Tech. on the basis of merit in the admission test of respective session on vacant seats subject to **Clause 6.1.4.2**.
- 6.1.4.2** After change of branch the number of students in that branch should not fall below the sanctioned intake by more than ten percent and should not go above the sanctioned intake. For this purpose, the intake refers to the total sanctioned intake in the class inclusive of NRI students and exclusive of fail students in the class & admissions granted on supernumerary basis such as Government nominee students etc. The branch change is not applicable to NRI students and the admissions granted on supernumerary basis such as Government nominee students, etc.

6.1.5 CURRICULUM STRUCTURE OF THE PROGRAMME

- 6.1.5.1** The University follows a specialized credit-based semester system. Every programme will have a specific curriculum for all semesters (semester I to semester VIII) with a syllabi consisting of theory, practical, project work, etc., as given below and shall be in accordance with the prescribed syllabus. The courses shall be covered through lectures, tutorials, laboratory classes, seminar, industrial and practical training, project, tours etc. as prescribed by the University.

Undergraduate Core Courses (UCC)

- (i) Basic Sciences & Maths (BSM)
- (ii) Engineering Fundamentals (EF)
- (iii) Departmental Core (DC)
- (iv) Management (M)
- (v) Humanities & Social Science Core (HSSC)
- (vi) Project (P)

Undergraduate Programme Electives (UPE)

- (i) Programme Electives (PE)
- (ii) Open Elective (OE)
- (iii) Humanities & Social Science Elective (HSSE)

Audit Courses

- (i) Audit Course (AC)
- (ii) Seminar
- (iii) Industrial/Practical Training (IPT)

Every department will prescribe Seminar as audit requirement for the B. Tech. Degree. Seminar is a course wherein under the guidance of a faculty member a student is expected to do an in-depth study in a specialized area by doing survey of published technical literature, understanding different aspects of the selected topic and arriving at a status report. While doing a seminar, the student is expected to critically analyze works of various authors/researchers, learn the investigation methodologies, study concepts, techniques and the results presented in these papers, and present a seminar report. It is mandatory to give a seminar presentation of stipulated duration before a panel constituted for the purpose by the department.

The duration for industrial/practical training of project based type preferably will be of 60 to 75 days duration after semester VI which could be under Cooperative Education Model (CO-

OP Model). If student could not be assigned for 60 to 75 days project based training in industry, he/she has to complete 30 days industrial training along with 30 to 45 days society/commercial/industrial problem related minor project under the supervision of designated faculty supervisor from his/her department of University. The student will submit a report on the industrial/practical training and/or minor project report to the Head of Department for evaluation through a committee of faculty members constituted by the Head of Department.

Each course is assigned a certain number of credits as follows. Few audit courses as per demand and requirement of students shall be offered.

- (a) 1 credit per lecture hour per week
- (b) 1 credit per tutorial hour per week
- (c) 1 credit per 2 hours laboratory/practice/project per week.

The curriculum for any B.Tech. Programme of study has been designed with total minimum credits of 180 and total minimum 20 credits of audit courses for those admitted in 1st year of B.Tech. Program. The minimum credit requirement will be 130 and total minimum 14 credits of audit courses for lateral entry in II year of B. Tech.

6.1.5.2 Overall Credit Structure

Credit Courses			
Undergraduate Core Courses (UCC)		Undergraduate Programme Electives (UPE)	
Category	Min. Credits	Category	Min. Credits
Basic Sciences & Maths (BSM)	36	Program Electives (PE)	16
Engineering Fundamentals (EF)	24	Open Electives (OE) (Other Departments)	3
Departmental Core (DC)	78	Humanities & Social Science Elective (HSSE)	3
Management (M)	6		
Humanities & Social Science Core (HSSC)	4		
Project (P)	10		
Total	158	Total	22
Grand Total	180 (minimum)		
Audit Courses			
Audit Course (AC) (Min. 3 credits audit subjects from other departments will be offered during semester I-V)			16
Seminar			3
Industrial/Practical Training (IPT)			1
Total	20 (minimum)		

Each student has to register for a set of courses as offered by his/her department in each semester by paying the stipulated fees, which include tuition fee, examination fee, enrolment fee, development fee, insurance fee, degree fee, alumni fee, internet charges, hostel fee, mess advance, miscellaneous user charges etc. as applicable from time to time.

6.1.5.3 NCC/NSS/NSO Training

One of the three activities, National Cadet Corps (NCC) or National Sports Organization (NSO) or National Social Service (NSS) training is compulsory for all the Undergraduate students. A student who has not completed the NCC/NSO/NSS requirements in first four semesters will not be permitted to continue the B.Tech. Degree Programme. These are normally conducted during evenings of week days or Sunday and are designed for character building and to sensitize the students towards social/national issues. These activities carry no credits and a student should satisfactorily complete the prescribed NCC/NSO/NSS programme by securing 'S' grade as prescribed in **Clause 6.1.6.1**.

6.1.5.4 Other Activities

The other general proficiency activities will include Games/Sports/Cultural/Literary/ Practical/Field Activities/Industrial visit/Extension Lectures. It will be carried out beyond class hours. Students may be taken on conducted tours through industrial works arranged by the department to expose them to various technologies employed in the industry. The curriculum will also include other curricular, co-curricular activities and extra curricular activities as may be prescribed by the University from time to time. The general proficiency remark as per **Clause 6.1.6.2(h)** shall appear in the Grade Card of the student in each semester.

6.1.6 GRADING SYSTEM AND ASSESSMENT PROCEDURE

6.1.6.1 Grading System

The academic performance evaluation of a student will be according to a Letter Grading system based on class performance of students. The Letter Grades and the corresponding Grade Points are as follows. Grades falling between A(+) and D in different subjects are called pass grades, while the students securing F grade will be treated fail in the subject and shall have to appear in re-major examination or repeat the semester as per provision of **Clause 6.1.7 & 6.1.9**, respectively.

Letter Grade	Grade Points	Description
A(+)	10	Outstanding
A	9	Excellent
B(+)	8	Very Good
B	7	Good
C	6	Average
D	5	Below Average
F	0	Fail
U	-	Short Attendance
W	-	Withdrawal
I	-	Incomplete
AP	-	Audit Pass
AF	-	Audit Fail
S	-	Satisfactory Completion
Z	-	Course Continuation

Grade Award System

Grade	Grade Points	Marks (in %)
A(+)	10	90-100
A	9	80-89
B(+)	8	70-79
B	7	60-69
C	6	50-59
D	5	40-49
F	0	<40

6.1.6.2 Tests & Examinations

The theory and practical examinations shall comprise of continuous assessment throughout the semester in all subjects and Major examination conducted by University at the end of the semester (November/December or April/May). The assessment of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain points, will be awarded as per the range of total marks (out of 100) obtained by the candidate, as detailed below. The rounding off shall be done on the higher side.

(a) Distribution of Marks for Theory based Subject

S. N.	Assessment Basis	Duration	Marks	
1.	Continuous Evaluation	Minor Test-I	1 Hour	15
2.		Minor Test-II	1 Hour	15
3.		Minor Test-III	1 Hour	15
4.		Tutorial/Assignment/Quiz/Attendance	-	15
5.	Major Examination	3 Hours	40	

(b) Distribution of Marks for Practical based Subject

S. N.	Assessment Basis	Duration	Marks	
1.	Continuous Evaluation	Viva Voce-I	-	10
2.		Viva Voce-II	-	10
3.		Viva Voce-III	-	10
4.		Practical Work/Attendance/Record/ Viva Voce	-	30
5.	Major Examination	3 Hours	40	

(c) Distribution of Marks for Theory & Practical based Subject

S. N.	Assessment Basis	Duration	Marks	
1.	Continuous Evaluation	Minor Test-I	1 Hour	10
2.		Minor Test-II	1 Hour	10
3.		Minor test-III	1 Hour	10
4.		Tutorial/Attendance/Home Assignment/Quiz	-	10
5.	Practical Work/Record/Viva Voce/ Practical Examination			20
6.	Major Theory Examination	3 Hours	40	

Note: The syllabus for Minor Test-I, Minor Test-II and Minor Test-III will be 25% each in a successive manner. However, the Major examination will be conducted from the entire syllabus of the subject.

Students, who are absent in Minor Test-I/Minor Test-II/Minor Test-III on genuine grounds such as admission to hospital or representing the University with prior permission and reporting to the Head of Department concerned within two days of rejoining, may be permitted for only one special test with the permission of the Head of Department concerned. The special test will be conducted after the Minor Test-III. The coverage for the special test shall be the combined syllabus of Minor Test-I/Minor Test-II/Minor Test-III of the subject.

(d) Distribution of Marks for Project Based Industrial/Practical Training

For evaluation of industrial/practical training, the respective industry shall nominate an In-charge/Supervisor from its organization under intimation to the University. For evaluation by the respective University department, Head of Department shall get it done by a panel of teachers. The three month industrial training of project based type could be under Cooperative Education Model (CO-OP Model)

60 to 75 days Industrial/Practical Training

There will be **two** parts in the evaluation process.

- Part A: Marks Awarded by the respective Industrial/Practical training organization : 40
- Part B : Marks Awarded by the Department/Centre for Industrial/ Practical training : 60

S. N.	Assessment Basis		Marks	
1.	Part A	Technical Quality of the work	20	
		Internal Marks	Attendance	5
			Discipline	5
			Involvement	5
			Interest of the student	5
2.	Part B	Project Work	20	
		Viva Voce & Presentation	30	
		Project Report	10	

30 days Industrial Training and 30 to 45 days Minor Project in University Department

There will be **three** parts in the evaluation process.

- Part A : Marks Awarded by the respective Industrial/Practical training organization : 20
- Part B : Marks Awarded by the Department/Centre for Industrial/Practical training : 30
- Part C : Marks Awarded for Minor Project : 50

S. N.	Assessment Basis		Marks	
1.	Part A	Technical Quality of the work	10	
		Internal Marks	Attendance	3
			Discipline	2
			Involvement	3
			Interest of the student	2
2.	Part B	Project Work/Learning in Industry	10	
		Viva Voce & Presentation	15	
		Project Report	5	
3.	Part C	Relevance, Scope and Dimension of Project	10	
		Application Methodology	10	
		Analysis, Result and Report	10	
		Final Product	20	

(e) Distribution of Marks for Seminar

S. N.	Assessment Basis	Marks
1.	Quality of Material	30
2.	Quality of Presentation	30
3.	Quality & Extent of Response of Questions Asked	20
4.	Participation in Other Seminars (Attendance)	20

Any student securing less than 40 marks ('F' grade) in seminar shall have to repeat the seminar in the same semester. This will be limited to only one chance.

(f) Distribution of Marks for Project

In 7th Semester

S. N.	Assessment Basis	Duration	Marks	
1.	Continuous Evaluation	Viva Voce-I/Presentation	-	15
2.		Viva Voce-II/ Presentation	-	15
3.		Viva Voce-III/ Presentation	-	15
4.		Preliminary Project Report, Effort and Regularity (awarded by supervisor)	-	25
5.	End Semester Presentation	1 Hour	30	

In 8th Semester

S. N.	Assessment Basis	Duration	Marks	
1.	Continuous Evaluation	Viva Voce-I/Presentation	-	10
2.		Viva Voce-II/ Presentation	-	10
3.		Viva Voce-III/ Presentation	-	10
4.		Final Project Report & Contribution Made to Literary World (awarded by supervisor)	-	30
5.	Major Examination	1Hour	40	

Students are required to begin project work after the end of B.Tech. III year Major Examination. A project grade is awarded in both the semesters on the basis of the prescribed evaluation process. The project may be related to a theoretical modeling, simulation and analysis, experimental investigation, a proto-type design, product design and development, a new correlation and analysis of data, fabrication and setup of new equipment etc. preferably useful for the society/industry.

(g) Audit Courses

S. N.	Audit Course Status	Marks Obtained
1.	Audit Pass (AP)	50% and Above
2.	Audit Fail (AF)	Below 50% , Candidate has to repeat the course

(h) Distribution of Marks for General Proficiency

General proficiency remark will be based on the cumulative percentages of marks scored by the student during each semester through various components as detailed below. Detailed distribution for award of marks in each component and/or their weightage may be as prescribed by the University from time to time.

S. N.	Assessment	Weightage of Marks
1.	Discipline/Behaviour of Students Inside/Outside University campus	40%
2.	Games/Sports/Cultural/Literary Events	40%
3.	Academic & Research/Special Lecture/Extra-curricular Events & Industrial Visits	20%

S. N.	Marks Secured	Remark
1.	80-100%	Excellent
2.	60-79%	Very Good
3.	40-59%	Good
4.	20-39%	Satisfactory
5.	<20%	Average

6.1.7 RE-MAJOR EXAMINATION

Student with F grade in any subject will be required to appear in the re-major examination along with regular semester examinations in the forthcoming respective semester(s) in the same maximum marks as that of the previous major examination, provided she/he has scored at least 40% of the total marks allocated for continuous evaluation in the concerned subject. However, special re-major subject examination for the both odd & even semester subjects may be arranged annually in the month of June for the students who have already appeared in VI or VIII semester major examinations provided they could not improve F grade in respective subjects in regular semester examinations.

6.1.8 EVALUATION OF PERFORMANCE

The performance of a student will be evaluated in terms of two indices, viz. the Semester Grade Point Average (SGPA) which is the Grade Point Average for a semester, and Cumulative Grade Point Average (CGPA) which is the Grade Point Average for all the completed semesters at any point in time considered cumulatively.

Points Secured in the Semester = \sum (Course Credits \times Grade Point) for courses in which A(+) to D grade has been obtained

Total Credits Registered in the Semester Excluding Audit Courses = \sum (Course credits) for courses in which A(+) to D grade has been obtained

$$\text{SGPA} = \frac{\text{Points secured in the semester in all passed courses (A(+) to D Grade)}}{\text{Total Credits registered in the semester excluding audit courses}}$$

The CGPA is calculated on the basis of all pass grades, except audit courses and courses in which S or Z grade is awarded/secured in all completed semesters.

Cumulative Points secured in All Passed Courses = \sum (Course Credits \times Grade Point) for courses in which A(+) to D grade is obtained

Cumulative Total Credits Excluding Audit Courses = \sum (Course credits) for courses in which A(+) to D grade is obtained

$$\text{CGPA} = \frac{\text{Cumulative Points secured in all passed courses (A(+) to D Grade)}}{\text{Cumulative total credits excluding audits courses}}$$

An example of these calculations is given below.

ODD Semester

Course No.	Course Credits	Grade Awarded	Total Credits	Grade Point	Points Secured
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
XX101	5	B	5	7	35
XX102	4	C	4	6	24
XX103	4	A(+)	4	10	40
XX104	2	B(+)	2	8	16
XX106	4	D	4	5	20
XX107	-	S	-	-	-
XX108 (AC)	3	AP	-	-	-
Total	19		19		135

Credits registered in the semester excluding audit courses (total of column 2) = 19
 Total credits in the semester excluding audit courses (total of column 4) = 19

Points secured in this semester (total of column 6 for all passed courses) = 135

$$SGPA = \frac{\text{Points secured in the semester in all passed courses (A(+)) to D Grade}}{\text{Total Credits registered in the semester excluding audit courses}} = \frac{135}{19} = 7.105$$

$$CGPA = \frac{\text{Cumulative Points secured in all passed courses (A(+)) to D Grade}}{\text{Cumulative total credits, excluding audits courses}} = \frac{135}{19} = 7.105$$

Semester performance: Total credits (E.C.) = 19 SGPA = 7.105
 Cumulative performance: Total credits (E.C.) = 19 CGPA = 7.105

EVEN Semester

Course No.	Course Credits	Grade Awarded	Total Credits	Grade Point	Points Secured
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
XX151	5	B(+)	5	8	40
XX152	4	A	4	9	36
XX153	4	F	-	0	0
XX154	2	B	2	7	14
XX155	4	C	4	6	24
XX156	4	A(+)	4	10	40
XX157	-	S	-	-	-
XX158 (AC)	3	AF	-	-	-
Total	23		19		154

Credits registered in the semester excluding audit courses (total of column 2) = 23
 Total credits in the semester excluding audit courses (total of column 4) = 19
 Points secured in this semester (total of column 6 for all passed courses) = 154
 Cumulative points in all passed courses = 135 (past semesters) + 154 (this sem.) = 289

Cumulative total credits = 19 (past semesters) + 19 (this sem.) = 38

$$SGPA = \frac{\text{Points secured in the semester in all passed courses (A(+)) to D Grade}}{\text{Total Credits registered in the semester excluding audit courses}} = \frac{154}{19} = 8.105$$

$$CGPA = \frac{\text{Cumulative Points secured in all passed courses (A(+)) to D Grade}}{\text{Cumulative total credits, excluding audits courses}} = \frac{135 + 154}{19 + 19} = 7.605$$

Semester performance: Total credits (E.C.) = 19 SGPA = 8.105
 Cumulative performance: Total credits (E.C.) = 38 CGPA = 7.605

6.1.9. ACADEMIC CRITERIA FOR CONTINUATION

6.1.9.1 A minimum 5.0 CGPA is required in order to qualify for continuation of registration at any stage and award of the degree at the end of 8th semester.

6.1.9.2 A student must register a minimum of 18 credits in a semester which shall essentially include the pre-requisite subjects. It allows the students to progress at an optimum pace suited to individual ability and convenience, subject to fulfilling minimum requirement for continuation in stipulated duration.

- (a) **For B.Tech. 1st Year Students**
They must earn 50% of total Credits (i.e. min. 23 credits) in odd and even semester of an academic session for promotion to 2nd Year in all branches failing which they have to re-register & repeat complete 1st Year.
- (b) **For B.Tech. 2nd Year Students**
They must earn 90% of total Credits (i.e. min. 45 credits) in the 1st year and 50% of total (i.e. min. 23 credits) Credits in odd and even semester of an academic session of 2nd year for promotion to 3rd year failing which they have to re-register & repeat complete 2nd Year or earn the requisite credits through re-major examination in respective year as case may be.
- (c) **For B.Tech. 3rd Year Students**
They must earn 90% of total Credits in the 2nd year and 50% Credit in the 3rd year for promotion to 4th year failing which they have to re-register & repeat complete 3rd Year or earn the requisite credits through re-major examination in respective year as case may be.

6.1.9.3 A student is considered to pass in a particular subject if he/she secures A(+) to D grade in it and the marks obtained are 40% or more in continuous evaluation of the subject. In case of the marks in continuous evaluation of any subject of a semester being less than 40% then the student has to repeat the semester completely and continue as per **Clause 6.1.9.2**.

6.1.10 AWARD OF DIVISION, RANK AND MEDALS

6.1.10.1 A candidate who satisfies the course requirements for all semesters and who passes all the examinations prescribed for all the eight semesters (six semesters for lateral entry candidates) within a maximum period of six years (five years for lateral entry candidates) reckoned from the commencement of the first semester/third semester to which the candidate was admitted shall be declared to have qualified for the award of degree subject to the fulfillment of requirements of **Clause 6.1.9.1**. Award of the Division in the degree shall be governed by the provisions given below.

- (a) A candidate who qualifies for the award of the degree securing D or above grades in all subjects pertaining to all semesters in his/her first attempt within eight consecutive semesters (four academic years)/six consecutive semesters (three academic years) as applicable, and in addition secures a CGPA of 7.5 and above for the semesters I to VIII shall be declared to have passed the examination in **FIRST DIVISION WITH HONOURS**.
- (b) A candidate who qualifies for the award of the degree by securing D or above grades in all subjects of all the semesters within a maximum period of eight semesters/six semesters as applicable, after his/her commencement of study in the 1st /3rd semester and in addition secures CGPA not less than 6.5 shall be declared to have passed the examination in **FIRST DIVISION**.
- (c) All other candidates who qualify for the award of degree by securing D or above grades in all subjects of all semesters within a maximum period of eight semesters/six semesters as applicable, after his/her commencement of study in the 1st /3rd semester shall be declared to have passed the examination in **SECOND DIVISION**.

6.1.10.2 For the Award of **Ranks** for each branch of study and overall for the programme, the CGPA secured in all semesters shall be considered and it is mandatory that such candidate should have passed all the subjects by securing D or above grades in all the semesters in the first attempt in 4/3 year duration of programme as applicable. Rank certificates in the form of

“Certificate of Merit” would be issued to top three students as 1st, 2nd & 3rd rank in each branch of study and to one student as “University topper of B.Tech.” on the overall basis in the programme selected on the basis of CGPA in particular academic session.

6.1.10.3 Following **Medals** will be awarded annually by the University to the passing out students identified as prescribed in **Clause 6.1.10.2**.

- (a) **Chancellor Gold Medal**-This gold medal is awarded to the “University topper of B.Tech.” i.e. the passing out B.Tech. students who is adjudged to be the academically best, securing the highest CGPA at the end of the eighth semester in first attempt for B.Tech. Degree programme amongst the graduating students of all B.Tech. Courses as per the **Clause 6.1.10.2**.
- (b) **Vice-Chancellor Gold Medal**-The Gold Medal is awarded to the student who secures the highest CGPA at the end of semester VIII in first attempt, i.e. 1st Rank holder for each branch of the B. Tech. programme.
- (c) **Vice-Chancellor Silver Medal**-The Silver Medal is awarded to the student who secures the second highest CGPA at the end of semester VIII in first attempt i.e. 2nd Rank holder for each of the B.Tech. Course.

6.1.11 ATTENDANCE

6.1.11.1 Every faculty member handling a course will record attendance from the scheduled date of commencement of classes upto 3 calendar days before the last instructional day in the semester as per academic calendar. The cumulative percentages of attendance will be recorded in the office of the Dean handling academic affairs of such students of the University. The attendance remark in the grade card will be shown based on the cumulative percentages of attendance calculated for the period between the date of commencement of classes and the last date for recording the attendance in all the registered subjects (credits and audit courses) in the semester as per the following table. Cumulative attendance remark shall appear in the Grade Card in each semester

S. N.	Attendance	Remark
1.	90-100%	Very Good
2.	80-89%	Good
3.	75-79%	Satisfactory
4.	<75%	Poor

6.1.11.2 A student is expected to attend all classes, laboratory, seminar, project, tour and tutorial sessions that are formally scheduled and a formal attendance will be taken in each such session. It is recognized that due to illness and other emergent reasons there may be instances when a student is unable to join the scheduled academic activities; a leave application duly recommended and forwarded by the student’s Head of Department should be submitted in such cases at the earliest to office of the Dean. Such absence can not be more than 25% of the total classes held in a subject which needs to be got condoned as prescribed in **Clause 6.1.11.3**.

6.1.11.3 For the students who have less than 100% but more than 75% attendance in a semester if their medical leave is considered for condonation of attendance then they are eligible for seeking the privilege of upgradation of the attendance remark.

6.1.11.4 A student, who has a cumulative attendance lower than 75% in the semester whatever, may be the reason for the shortfall in attendance, will not be permitted to appear in the University Major Examinations. Such candidates will have to repeat their study in the same semester in

coming academic session and his/her registration for that semester will be treated as cancelled, and she/he shall be awarded 'U' in that semester.

6.1.12 REGISTRATION AND ENROLMENT

- 6.1.12.1** The University follows a specialized credit based semester system, therefore registration at the beginning of each semester on the prescribed dates announced in the Academic Calendar, is mandatory for every student till she/he completes her/his programme. If a student does not register in a particular semester, her/his studentship is liable to be cancelled. Without registration, any academic activity (course/seminar/project etc) undergone by a student will not be counted towards the fulfillment of requirements of her/his degree.
- 6.1.12.2** Every student admitted shall have his/her unique registration number. The registration number shall have ten digits. First four digit shall indicate year of admission; next two shall indicate his/her branch of study, next one shall indicate his/her level (Undergraduate, Postgraduate, Ph.D., etc.) and last three digits shall indicate his/her serial number/roll number or as prescribed from time to time. Every student shall be identified by this registration number through out his stay in the University.
- 6.1.12.3** Registration should be carried out by the student himself/herself on stipulated date, but not later than the first week of each semester as late registration upon payment of prescribed late fees as decided from time to time. In any case, registration must be completed before the prescribed last date for registration, failing which he/she will not be registered in that particular session. Such students will have to register in coming next academic session if it is permissible under **Clause 6.1.3** else his/her studentship is liable to be cancelled except for those availing provision of **Clause 6.1.13**.
- 6.1.12.4** Students having any kind of outstanding dues to the University or hostel shall be permitted to register only after clearing the outstanding dues.
- 6.1.12.5** In-absentia registration may be allowed only in rare cases at the discretion of the Vice-Chancellor of the University in case of serious illness/natural calamities/ unavoidable circumstances upon the recommendation of Dean.

6.1.13 TEMPORARY DISCONTINUATION OF COURSE

- 6.1.13.1** Discontinuation of the course will not be allowed to B.Tech. first year students. However, if a student of other years wishes to temporarily discontinue the course for valid reasons, she/he shall apply through the Head of Department in advance and obtain a written order from the University permitting discontinuance.
- 6.1.13.2** A candidate after temporary discontinuance may rejoin the course only at the commencement of the semester at which she/he discontinued, provided she/he pays the prescribed fees to the University for the discontinuation period also. The total period of completion of the course reckoned from the commencement of the first semester to which the candidate was admitted shall not in any case exceed six academic years (five academic years for lateral entry), including of the period of discontinuance.

6.1.14 UNFAIR MEANS

Cases of unfair means shall be dealt as per the rules of the University.

6.1.15 GENERAL ELIGIBILITY FOR AWARD OF B. TECH. DEGREE

A student shall be declared to be eligible for award of the B.Tech. Degree if he/she has

- (a) registered and successfully completed all the required core/elective/audit courses and projects and other requirements of programme as prescribed in this Ordinance or as prescribed by the University from time to time;
- (b) successfully acquired the minimum required credits/audits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time as prescribed in this Ordinance or as prescribed by the University from time to time;
- (c) earned the specified credits in all the categories of subjects;
- (d) completed the NCC/NSO/NSS requirements;
- (e) has no dues to the University, Hostels, Libraries, NCC/NSS/NSO etc., and
- (f) no disciplinary action is pending against him/her.

6.1.16 POWER TO MODIFY

Notwithstanding all that has been stated above, the Academic Council has the right to modify partly or completely the provisions of above ordinances with the approval of Board of Management. Under extreme exceptional circumstances arising out of certain inconsistency in the ordinance or otherwise, the Vice-Chancellor can take suitable decision in deference to the laid down provisions provided standard of evaluation is not compromised and the same shall be reported to ensuing Academic Council/Board of Management with suitable justification. Such actions of Vice-Chancellor shall not be treated as precedence under any circumstances.

6.1.17 CURRICULUM FOR B.TECH. PROGRAMMES

The curriculum for any B.Tech. Programme of study has been designed with total minimum credits of 180 and total minimum 20 credits of audit courses for those admitted in 1st year of B. Tech. Programme. The minimum credit requirement will be 130 and total minimum 16 credits of audit courses for lateral entry in II year of B.Tech. Programme. A student must register a minimum of 18 credits in each semester.

Freshman Year, Semester I

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM			3	1	0/2	4/5
2.	BSM			3	1	0/2	4/5
3.	EF			3	1	2	5
4.	EF			3	1	0/2	4/5
5.	HSSC			3	1	0/2	4/5
6.	EF			0	0	4	2
7.	AC						-
Total				15	5	6/14	23/27

Freshman Year, Semester II

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM			3	1	2	5
2.	BSM			3	1	0/2	4/5
3.	BSM			3	1	0/2	4/5
4.	EF			3	1	0/2	4/5
5.	HSSE			2/3	1	0	3/4
6.	EF			0	0	4	2
7.	AC						-
Total				14/15	5	6/12	22/26

Sophomore Year, Semester III

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM			3	1	0/2	4/5

2.	BSM			3	1	0/2	4/5
3.	EF			3	1	0/2	4/5
4.	DC			2/3	1	0/2	3/5
5.	DC			3	1	2	5
6.	EF			0	0	4	2
7.	AC						-
			Total	14/15	5	6/14	22/27

Sophomore Year, Semester IV

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM			3	0/1	0/2	3/5
2.	M			2/3	1	0	3/4
3.	DC			3	1	2	5
4.	DC			3	1	0/2	4/5
5.	DC			3	1	0/2	4/5
6.	EF			0	0	4	2
7.	AC						-
			Total	14/15	4/5	6/12	21/26

Junior Year, Semester V

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	M			2/3	1	0	3/4
2.	DC			3	1	0/2	4/5
3.	DC			3	1	0/2	4/5
4.	DC			3	1	2	5
5.	DC			3	1	2	5
6.	AC						
			Total	14/15	5	4/8	21/24

Junior Year, Semester VI

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	DC			3	1	0/2	4/5
2.	DC			3	1	0/2	4/5
3.	DC			3	1	0/2	4/5
4.	DC			3	1	2	5
5.	DC			3	1	2	5
6.	AC		Seminar				-
			Total	15	5	4/10	22/25

Senior Year, Semester VII

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	DC			3	1	2	5
2.	DC			3	1	0/2	4/5
3.	PE1			3	1	0/2	4/5
4.	PE2			3	1	0	4
5.	P		Project Part-I	0	0	10	5
6.	AC		Industrial/Practical Training				-
			Total	12	4	12/16	22/24

Senior Year, Semester VIII

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	DC			3	1	2	5
2.	PE3			3	1	0/2	4/5
3.	PE4			3	1	0	4
4.	OE			3	1	0	4
5.	P		Project Part-II	0	0	10	5
			Total	12	4	12/14	22/23

Section B

CURRICULA

CIVIL ENGINEERING DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

Credit Structure for B.Tech. (Civil Engineering)
(For newly admitted students from Session 2014-2015)

Category	Semester	I	II	III	IV	V	VI	VII	VIII	Total
Basic Science & Maths (BSM)		9	14	9	5	-	-	-	-	37
Engineering Fundamentals (EF)		12	7	7	-	-	-	-	-	26
Departmental Core (DC)		-	-	10	19	20	24	9	5	87
Management (M)		-	-	-	3	3	-	-	-	6
Humanities & Social Science Core (HSSSC)		4	-	-	-	-	-	-	-	4
Project (P)		-	-	-	-	-	-	5	5	10
Programme Electives (PE)		-	-	-	-	-	-	8	8	16
Open Electives (OE)		-	-	-	-	-	-	-	4	4
Humanities & Social Science Electives (HSSE)		-	3	-	-	-	-	-	-	3
Total		25	24	26	27	23	24	22	22	193

Curriculum for B.Tech. (Civil Engineering)

Freshman Year, Semester-I

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-01	Engineering Mathematics-I	3	1	0	4
2.	BSM	BAS-02	Engineering Physics-I	3	1	2	5
3.	EF	BCE-01	Mechanics of Structures	3	1	2	5
4.	EF	BCS-01	Introduction to Computer Programming	3	1	2	5
5.	HSSC	BAS-03	Professional Communication	3	1	0	4
6.	EF	BCE-10	Engineering Graphics	0	0	4	2
7.	AC	BAS-05	Environment & Ecology	2	1	0	-
Total				15	5	10	25

Freshman Year, Semester-II

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-07	Engineering Mathematics-II	3	1	0	4
2.	BSM	BAS-08	Engineering Physics-II	3	1	2	5
3.	BSM	BAS-09	Engineering Chemistry	3	1	2	5
4.	EF	BEE-01	Principles of Electrical Engineering	3	1	2	5
5.	HSSE	BAS-**	Humanities & Social Science Electives	2	1	0	3
6.	EF	BME 10	Workshop Technology	0	0	4	2
7.	AC	BEC 01	Fundamentals of Electronics Engineering	3	1	2	-
Total				14	5	10	24

Sophomore Year, Semester-III

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS 07	Engineering Mathematics-III	3	1	0	4
2.	DC	BCE 11	Concrete & Concrete Structures	3	1	2	5
3.	EF	BCE 12	Basic Surveying	3	1	2	5
4.	BSM	BCE 13	Fluid Mechanics	3	1	2	5
5.	DC	BCE 14	Structural Mechanics-I	3	1	2	5

6.	EF	BCE 15	Engineering Geology & Building Material	0	0	4	2
7.	AC	BAS 22	Nano Technology	2	1	0	-
Total				15	5	12	26

Sophomore Year, Semester-IV

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-24	Applied Computational Methods	3	1	2	5
2.	M	MBA-01	Industrial Management	2	1	0	3
3.	DC	BCE-16	Hydraulic and Hydraulic Machines	3	1	2	5
4.	DC	BCE-17	Structural Mechanics -II	3	1	0	4
5.	DC	BCE-18	Advanced Surveying	3	1	2	5
6.	DC	BCE-19	Building Construction and Planning Estimation and Costing	3	1	2	5
7.	AC	BAS-20	Communication Skills	0	0	4	-
Total				17	6	8	27

Junior Year, Semester-V

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	M	MBA-02	Industrial Economics and Management	2	1	0	3
2.	DC	BCE-26	Environmental Engineering-I	3	1	2	5
3.	DC	BCE-27	Geotechnical Engineering -I	3	1	2	5
4.	DC	BCE-28	Transportation Engineering- I	3	1	2	5
5.	DC	BCE-29	Design of Concrete Structures	3	1	2	5
6.	AC	BCS-68	Neural Network & Fuzzy Systems	3	1	0	-
Total				14	5	8	23

Junior Year, Semester-VI

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BCE-31	Geotechnical Engineering -II	3	1	2	5
2.	DC	BCE-32	Environmental Engineering -II	3	1	0	4
3.	DC	BCE-33	Steel Structures	3	1	0	4
4.	DC	BCE-34	Transportation Engineering- II	3	1	0	4
5.	DC	BCE-35	Construction Technology and Management	3	1	0	4
6.	DC	BCE-36	Survey Camp*	0	0	9	3
7.	AC	BCE-30	Seminar	0	0	6	-
Total				15	5	11	24

* Survey camp will be held during Winter Break

Senior Year, Semester-VII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BCE-41	Water Resources Engineering	3	1	0	4
2.	DC	BCE-42	Earthquake Resistant Design	3	1	2	5
3.	PE1	BCE-**	Programme Elective-1	3	1	0	4
4.	PE2	BCE-**	Programme Elective-2	3	1	0	4
5.	P	BCE-40	Project Part -I	0	0	10	5
6.	AC	BCE-45	Industrial /Practical Training	0	0	2	-
Total				12	4	12	22

Senior Year, Semester-VIII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BCE-43	Analysis and Design of Hydraulic Structures	3	1	2	5
2.	PE3	BCE-**	Programme Elective-3	3	1	0	4
3.	PE4	BCE-**	Programme Elective-4	3	1	0	4

4.	OE	BOE-**	Open Electives	3	1	0	4
5.	P	BCE-50	Project Part II	0	0	10	5
Total				12	4	12	22

Engineering Fundamentals & Department Core (Civil Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
Year-I							
1.	BCE-01	Mechanics of Structures	-	3	1	2	5
2.	BCE-10	Engineering Graphics	-	0	0	4	2
Year-II							
3.	BCE-11	Concrete and Concrete Structures	-	3	1	0	4
4.	BCE-12	Basic Surveying	-	3	1	2	5
5.	BCE-13	Engineering Geology & Building Material	-	0	0	4	2
6.	BCE-14	Structural Mechanics-I	-	3	1	2	5
7.	BCE-15	Fluid Mechanics	-	3	1	2	5
8.	BCE-16	Hydraulic and Hydraulic Machines	Fluid Mechanics	3	1	2	5
9.	BCE-17	Structural Mechanics -II	Structural Mechanics-I	3	1	0	4
10.	BCE-18	Advanced Surveying	Basic Surveying	3	1	2	5
11.	BCE-19	Building Construction and Planning Estimation and Costing	Engineering Graphics	3	1	2	5
Year-III							
12.	BCE-26	Environmental Engineering-I	-	3	1	2	5
13.	BCE-27	Geotechnical Engineering-I	-	3	1	2	5
14.	BCE-28	Transportation Engineering-I	-	3	1	2	5
15.	BCE-29	Design of Concrete Structures	Concrete & Concrete Structures	3	1	2	5
16.	BCE-30	Seminar	-	0	0	6	3
17.	BCE-31	Geotechnical Engineering-II	Geotechnical Engineering-I	3	1	2	5
18.	BCE-32	Environmental Engineering-II	Environmental Engineering-I	3	1	0	4
19.	BCE-33	Steel Structures	Structural Mechanics -I & II	3	1	0	4
20.	BCE-34	Transportation Engineering-II	Transportation Engineering-I	3	1	0	4
21.	BCE-35	Construction Technology and Management	-	3	1	0	4
22.	BCE-36	Survey Camp	Basic Surveying	0	0	9	3
Year-IV							
23.	BCE-40	Project Part-I	-	0	0	10	5
24.	BCE-41	Water Resources Engineering	Fluid Mechanics	3	1	0	4
25.	BCE-42	Earthquake Resistant Design	Structural Mechanics – I & II	3	1	2	5
26.	BCE-43	Analysis and Design of Hydraulic Structures	Water Resources Engineering	3	1	2	5
27.	BCE-45	Industrial/Practical Training	-	0	0	2	1
28.	BCE-50	Project Part-II	Project Part-I	0	0	10	5

Programme Electives (PE1)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BCE-51	Solid Waste Management	-	3	1	0	4
2.	BCE-52	Environmental Impact Assessment	Environmental Engineering – I & II	3	1	0	4
3.	BCE-53	Rock Mechanics	Engineering Geology & Building Materials	3	1	0	4
4.	BCE-54	Bridge Engineering	Structural Engineering I & II & Concrete structures	3	1	0	4
5.	BCE-55	Disaster Management	-	3	1	0	4

6.	BCE-56	Advanced Engineering Hydrology	Water Resources Engineering	3	1	0	4
----	--------	--------------------------------	-----------------------------	---	---	---	---

Programme Electives (PE2)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BCE-57	Geo-environmental Engineering	Geotechnical Engineering I & II, Environmental Engineering-I & II	3	1	0	4
2.	BCE-58	Advanced Structural Engineering	Structural Mechanics – I & II	3	1	0	4
3.	BCE-59	Principles of Remote Sensing	Basic Surveying	3	1	0	4
4.	BCE-60	Airport, Docks & Harbour Engineering	Transportation Engineering-I & II	3	1	0	4
5.	BCE-61	Matrix Method of Analysis	Structural Mechanics-I & II	3	1	0	4
6.	BCE-62	Open Channel Flow	Fluid Mechanics & Hydraulic & Hydraulic Machines	3	1	0	4

Programme Electives (PE3)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BCE-63	Advanced Foundation Engineering	Geotechnical Engineering-I & II	3	1	0	4
2.	BCE-64	River Engineering	Open Channel Flow	3	1	0	4
3.	BCE-65	Advance Concrete Design	Design of Concrete Structures	3	1	0	4
4.	BCE-66	Water Resources Systems	Water Resources Engineering	3	1	0	4
5.	BCE-67	Principles of Geographic Information System	Remote Sensing	3	1	0	4
6.	BCE-68	Earth and Earth Retaining Structures	Geotechnical Engineering-I & II	3	1	0	4
7.	BCE-69	Air and Noise Pollution control	Environmental Engineering-I & II	3	1	0	4

Programme Electives (PE4)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BCE-70	Ground Improvement Techniques	Geotechnical Engineering-I & II	3	1	0	4
2.	BCE-71	Transportation System & Planning	Transportation Engineering-I & II	3	1	0	4
3.	BCE-72	Industrial Pollution control and Environmental Audit	Environmental Engineering-I & II	3	1	0	4
4.	BCE-73	Structural Dynamics	Structural Engineering-I & II	3	1	0	4
5.	BCE-74	Advanced Hydraulic Structures	Water Resources Engineering	3	1	0	4
6.	BCE-75	Environmental Quality Management	Environmental Engineering-I & II	3	1	0	4

Subjects offered for other Departments

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BCE-02	Fire Hazards and Safety	-	2	1	0	3
2.	BCE-21	Environmental Impact Assessment & Management	-	3	1	0	4
3.	BOE-04	Principles of Remote Sensing	-	2	1	0	3
4.	BOE-05	Disaster Management	-	2	1	0	3

5.	BOE-06	Solid Waste Management	-	2	1	0	3
----	--------	------------------------	---	---	---	---	---

Humanities & Social Science Electives

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BAS-11	Human Values & Professional Ethics	-	2	1	0	3
2.	BAS-12	Industrial Psychology	-	2	1	0	3
3.	BAS-13	Industrial Sociology	-	2	1	0	3

COMPUTER SCIENCE & ENGINEERING DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

Credit Structure for B. Tech. (Computer Science & Engineering)

(For newly admitted students from Session 2014-2015)

Category	Semesters	I	II	III	IV	V	VI	VII	VIII	Total
Basic Sciences & Maths (BSM)		9	14	9	4	-	-	-	-	36
Engineering Fundamentals (EF)		12	7	6	2	-	-	-	-	27
Department Core (DC)		-	-	10	14	20	25	10	5	84
Management (M)		-	-	-	3	3	-	-	-	6
Humanities & Social Science Core (HSSC)		4	-	-	-	-	-	-	-	4
Project (P)		-	-	-	-	-	-	5	5	10
Programme Electives (PE)		-	-	-	-	-	-	8	8	16
Open Electives (OE)		-	-	-	-	-	-	-	4	4
Humanities & Social Science Electives (HSSE)		-	3	-	-	-	-	-	-	3
Total		25	24	25	23	23	25	23	22	190

Curriculum for B.Tech. (Computer Science & Engineering)

Freshman Year, Semester-I

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-01	Engineering Mathematics-I	3	1	0	4
2.	BSM	BAS-02	Engineering Physics-I	3	1	2	5
3.	EF	BCS-02	Introduction to C & Functional Programming	3	1	2	5
4.	EF	BEE-01	Principles of Electrical Engineering	3	1	2	5
5.	HSSC	BAS-03	Professional Communication	3	1	0	4
6.	EF	BCS-03	Software Lab-I	0	0	4	2
7.	AC	BAS-05	Environment & Ecology	2	1	0	-
Total				15	5	10	25

Freshman Year, Semester-II

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-07	Engineering Mathematics-II	3	1	0	4
2.	BSM	BAS-08	Engineering Physics-II	3	1	2	5
3.	BSM	BAS-14	Graph Theory	3	1	2	5
4.	EF	BCS-04	Object Oriented Modeling & C++	3	1	2	5
5.	HSSE	BAS-**	Humanities & Social Science Electives	2	1	0	3
6.	EF	BCS-05	Software Lab-II	0	0	4	2
7.	AC	BEC-01	Fundamentals of Electronics Engineering	3	1	2	0
Total				14	5	10	24

Sophomore Year, Semester-III

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-27	Discrete Mathematics	3	1	0	4
2.	BSM	BAS-24	Applied Computational Methods	3	1	2	5
3.	EF	BCS-11	Digital Circuits and Logic Design	3	1	0	4
4.	DC	BCS-12	Principles of Data Structures through C/C++	3	1	2	5
5.	DC	BCS-13	Internet & Java Programming	3	1	2	5
6.	EF	BCS-14	Software Lab-III	0	0	4	2
7.	AC	MAS 109/110/111	One of the Foreign Languages (French, German, Spanish etc.)	3	1	0	-
Total				15	5	10	25

Sophomore Year, Semester-IV

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-26	Optimization Techniques	3	1	0	4
2.	M	MBA 113	Management Information System	2	1	0	3
3.	DC	BCS-15	Database Management Systems	3	1	2	5
4.	DC	BCS-16	Theory of Computation	3	1	0	4
5.	DC	BCS-17	Computer Organization & Design	3	1	2	5
6.	EF	BCS-18	Software Lab-IV	0	0	4	2
7.	AC	BEC-32	Microprocessors & Application	3	1	2	-
Total				14	5	8	23

Junior Year, Semester-V

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	M	MBA-02	Industrial Economics & Management	2	1	0	3
2.	DC	BCS-26	Principles of Operating Systems	3	1	2	5
3.	DC	BCS-27	Computer Graphics	3	1	2	5
4.	DC	BCS-28	Design & Analysis of Algorithms	3	1	2	5
5.	DC	BCS-29	Advanced Computer Architecture	3	1	2	5
6.	AC	BEC-42	Digital Signal Processing	3	1	0	-
Total				14	5	8	23

Junior Year, Semester-VI

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BCS-31	Principle of Compiler Design	3	1	2	5
2.	DC	BCS-32	Artificial Intelligence	3	1	2	5
3.	DC	BCS-33	Web Technologies	3	1	2	5
4.	DC	BCS-34	Computer Networks	3	1	2	5
5.	DC	BCS-35	Software Engineering	3	1	2	5
6.	AC	BCS-30	Seminar	0	0	6	-
Total				15	5	10	25

Senior Year, Semester-VII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BCS-41	Introduction to Machine Learning	3	1	2	5
2.	DC	BCS-42	Parallel & Distributed Computing	3	1	2	5
3.	PE1	BCS-**	Programme Elective-1	3	1	0	4

4.	PE2	BCS-**	Programme Elective-2	3	1	0	4
5.	P	BCS-40	Project Part-I	0	0	10	5
6.	AC	BCS-45	Industrial/Practical Training	0	0	2	-
Total				12	4	14	23

Senior Year, Semester-VIII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BCS-43	Mobile Computing	3	1	2	5
2.	PE3	BCS-**	Programme Elective-3	3	1	0	4
3.	PE4	BCS-**	Programme Elective-4	3	1	0	4
4.	OE	***_**	One of Open Electives offered by other Department	3	1	0	4
5.	P	BCS-50	Project Part-II	0	0	10	5
Total				12	4	12	22

Engineering Fundamentals & Department Core (Computer Science & Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
I Year							
1.	BCS-02	Introduction to C & Functional Programming	-	3	1	2	5
2.	BCS-03	Software Lab-I	-	0	0	4	2
3.	BCS-04	Object Oriented Modeling & C++	-	3	1	2	5
4.	BCS-05	Software Lab-II	-	0	0	4	2
II Year							
5.	BCS-11	Digital Circuits and Logic Design	-	3	1	0	4
6.	BCS-12	Principles of Data Structures through C/C++	-	3	1	2	5
7.	BCS-13	Internet & Java Programming	-	3	1	2	5
8.	BCS-14	Software Lab-III	-	0	0	4	2
9.	BCS-15	Database Management Systems	-	3	1	2	5
10.	BCS-16	Theory of Computation	-	3	1	0	4
11.	BCS-17	Computer Organization & Design	-	3	1	2	5
12.	BCS-18	Software Lab-IV	-	0	0	4	2
III Year							
13.	BCS-26	Principles of Operating Systems	-	3	1	2	5
14.	BCS-27	Computer Graphics	-	3	1	2	5
15.	BCS-28	Design & Analysis of Algorithms	-	3	1	2	5
16.	BCS-29	Advanced Computer Architecture	-	3	1	2	5
17.	BCS-31	Principle of Compiler Design	-	3	1	2	5
18.	BCS-32	Artificial Intelligence	-	3	1	2	5
19.	BCS-33	Web Technologies	-	3	1	2	5
20.	BCS-34	Computer Networks	-	3	1	2	5
21.	BCS-35	Software Engineering	-	3	1	2	5
22.	BCS-30	Seminar	-	0	0	6	-
IV Year							
23.	BCS-41	Introduction to Machine Learning	-	3	1	2	5
24.	BCS-42	Parallel & Distributed Computing	-	3	1	2	5
25.	BCS-40	Project Part-I	-	0	0	10	5
26.	BCS-45	Industrial/Practical Training	-	0	0	2	-
27.	BCS-43	Mobile Computing	-	3	1	2	5
28.	BCS-50	Project Part-II	Project Part-I	0	0	10	5

Programme Electives (Computer Science & Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
PE1 & PE2 (VII Semester)							
1.	BCS-51	Advanced Java	Java Programming	3	1	0	4
2.	BCS-52	.Net Technology	-	3	1	0	4
3.	BCS-53	LAMP Technology	-	3	1	0	4
4.	BCS-54	Network Programming	Computer Networks	3	1	0	4
5.	BCS-55	Mobile Application Programming	Computer Networks	3	1	0	4
6.	BCS-56	Linux Administration & System Call Programming	Operating systems	3	1	0	4
7.	BCS-57	Database Administration with ORACLE	DBMS	3	1	0	4
8.	BCS-58	Data warehousing & Data Mining	DBMS	3	1	0	4
9.	BCS-59	Analytics and Systems of Big Data	DBMS	3	1	0	4
10.	BCS-60	Game Theory	-	3	1	0	4
PE3 & PE4 (VIII Semester)							
11.	BCS-62	Advanced Programming Techniques	-	3	1	0	4
12.	BCS-63	Computer Vision: Foundations and Applications	-	3	1	0	4
13.	BCS-64	Software Reuse	S/W Engineering	3	1	0	4
14.	BCS-65	Software Verification & Validation	S/W Engineering	3	1	0	4
15.	BCS-66	Software Design & Construction	S/W Engineering	3	1	0	4
16.	BCS-67	Software Quality Management	S/W Engineering	3	1	0	4
17.	BCS-68	Aspect Oriented Programming	-	3	1	0	4
18.	BCS-69	Neural Networks & Fuzzy Systems	-	3	1	0	4
19.	BCS-70	Fundamentals of Cloud Computing	Operating Systems, Computer Networks	3	1	0	4
20.	BCS-71	Advanced Multi-core Systems	Design & Analysis of Algorithms	3	1	0	4
21.	BCS-72	Cryptography & Information Security	-	3	1	0	4
22.	BCS-73	Digital Image Processing	Digital Signal Processing	3	1	0	4
23.	BCS-74	High Performance Computing	-	3	1	0	4
24.	BCS-75	Introduction to Real Time Systems	-	3	1	0	4

Subjects for other Departments

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BCS-51	Database Management System, Data Mining & Warehousing	-	3	1	0	4
2.	BCS-52	Web Designing	-	0	0	4	2
3.	BCS-01	Introduction to Computer Programming	-	3	1	2	5
4.	BOE-07	Introduction to Data & File Structures	-	2	1	2	4
5.	BOE-08	Introduction to Web Technology	-	2	1	2	4
6.	BOE-09	Linux & Shell Programming	-	2	1	2	4

Humanities & Social Science Electives

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BAS-11	Human Values & Professional Ethics	-	2	1	0	3
2.	BAS-12	Industrial Psychology	-	2	1	0	3

ELECTRICAL ENGINEERING DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

Credit Structure for B.Tech. Electrical Engineering
(For newly admitted students from Session 2014-2015)

Category	Semesters	I	II	III	IV	V	VI	VII	VIII	Total
Basic Sciences & Maths (BSM)		14	9	9	4	-	-	-	-	36
Engineering Fundamentals (EF)		12	7	7	2	-	-	-	-	28
Department Core (DC)		-	-	9	15	14	19	14	9	80
Management (M)		-	-	-	3	3	-	-	-	6
Humanities & Social Science Core (HSSC)		-	4	-	-	-	-	-	-	4
Project (P)		-	-	-	-	-	-	5	5	10
Programme Electives (PE)		-	-	-	-	4/5	4/5	4/5	4	16/19
Open Electives (OE)		-	-	-	-	-	-	-	4	4
Humanities & Social Science Electives (HSSE)		-	3	-	-	-	-	-	-	3
Total		26	23	25	24	21/22	23/24	23/24	22	187/190

Curriculum for B.Tech. (Electrical Engineering)

Freshman Year, Semester-I

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-01	Engineering Mathematics-I	3	1	0	4
2.	BSM	BAS-02	Engineering Physics-I	3	1	2	5
3.	EF	BEE-02	Electrical Circuits and Analysis	3	1	2	5
4.	EF	BEC-01	Fundamentals of Electronics Engineering	3	1	2	5
5.	BSM	BAS-09	Engineering Chemistry	3	1	2	5
6.	EF	BME-10	Workshop Technology	0	0	4	2
7.	AC		Audit Course				-
Total				15	5	12	26

Freshman Year, Semester-II

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-07	Engineering Mathematics-II	3	1	0	4
2.	BSM	BAS-08	Engineering Physics-II	3	1	2	5
3.	HSSC	BAS-03	Professional Communication	3	1	0	4
4.	EF	BME-02	Fundamentals of Mechanical Engineering	3	1	2	5
5.	HSSE	BAS-11	Human Values & Professional Ethics	2	1	0	3
6.	EF	BCE-10	Engineering Graphics	0	0	4	2
7.	AC		Audit Course				-
Total				14	5	8	23

Sophomore Year, Semester-III

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-21	Engineering Mathematics-III	3	1	0	4
2.	BSM	BME-15	Engineering Materials	3	1	2	5
3.	EF	BEC-13	Digital Electronics and Circuits	3	1	2	5
4.	DC	BEE-11	Basic System Analysis	3	1	0	4
5.	DC	BEE-12	Electrical Measurement & Measuring Instruments	3	1	2	5
6.	EF	BEE-20	Simulation Techniques	0	0	4	2
7.	AC		Audit Course				-
Total				15	5	10	25

Sophomore Year, Semester-IV

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-23	Engineering Mathematics-IV	3	1	0	4
2.	M	MBA-01	Industrial Management	2	1	0	3
3.	DC	BEE-13	Electromechanical Energy Conversion-I	3	1	2	5
4.	DC	BEE-14	Network Analysis and Synthesis	3	1	2	5
5.	DC	BEE-15	Introduction to Microprocessors	3	1	2	5
6.	EF	BAS-20	Communication Skills	0	0	4	2
7.	AC		Audit Course				-
Total				14	5	10	24

Junior Year, Semester-V

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	M	MBA-02	Industrial Economics and Management	2	1	0	3
2.	DC	BEE-26	Electromechanical Energy Conversion-II	3	1	2	5
3.	DC	BEE-27	Power System- I	3	1	0	4
4.	DC	BEE-28	Control System Engineering	3	1	2	5
5.	PE1	BEE-**	Programme Elective-1	3	1	0/2	4/5
6.	AC		Audit Course				-
Total				14	5	4/6	21/22

Junior Year, Semester-VI

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BEE-29	Instrumentation & Process Control	3	1	2	5
2.	DC	BEE-31	Power System- II	3	1	2	5
3.	DC	BEE-32	Power Electronics	3	1	2	5
4.	DC	BEE-33	Power Plant Engineering	3	1	0	4
5.	PE2	BEE-**	Programme Elective-2	3	1	0/2	4/5
6.	AC	BEE-30	Seminar	0	0	6	-
Total				15	5	6/8	23/24

Senior Year, Semester-VII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BEE-41	Electric Drives	3	1	2	5
2.	DC	BEE-42	Switch Gear & Protection	3	1	2	5
3.	DC	BEE-43	Power System Operation and Control	3	1	0	4

4.	PE3	BEE-**	Programme Elective-3	3	1	0/2	4/5
5.	P	BEE-40	Project Part –I	0	0	10	5
6.	AC	BEE-45	Industrial/Practical Training	0	0	2	-
Total				12	4	14/16	23/24

Senior Year, Semester-VIII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BEE-44	Utilization & Traction	3	1	2	5
2.	DC	BEE-46	Power Quality	3	1	0	4
3.	PE4	BEE-**	Programme Elective-4	3	1	0	4
4.	OE	BOE**	Open Elective	3	1	0	4
5.	P	BEE-50	Project Part- II	0	0	10	5
Total				12	4	12	22

Engineering Fundamentals & Department Core (Electrical Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
I Year							
1.	BEE-02	Electrical Circuits and Analysis	-	3	1	2	5
II Year							
2.	BEE-11	Basic System Analysis	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	0	4
3.	BEE-12	Electrical Measurement & Measuring Instruments	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	2	5
4.	BEE-13	Electromechanical Energy Conversion-I	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	2	5
5.	BEE-14	Network Analysis and Synthesis	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	2	5
6.	BEE-15	Introduction to Microprocessors	-	3	1	2	5
7.	BEE-20	Simulation Techniques	-	0	0	4	2
III Year							
8.	BEE-26	Electromechanical Energy Conversion-II	Electromechanical Energy Conversion-I	3	1	2	5
9.	BEE-27	Power System- I	-	3	1	0	4
10.	BEE-28	Control System Engineering	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	2	5
11.	BEE-29	Instrumentation & Process Control	Control System Engineering	3	1	2	5
12.	BEE-31	Power System- II	Power System- I	3	1	2	5
13.	BEE-32	Power Electronics	Digital Electronics and Circuits	3	1	2	5
14.	BEE-33	Power Plant Engineering	Power System-I	3	1	0	4
15.	BEE-30	Seminar	-	0	0	6	3
IV Year							
16.	BEE-41	Electric Drives	Power Electronics	3	1	2	5
17.	BEE-42	Switch Gear & Protection	Power System-I & II	3	1	2	5
18.	BEE-43	Power System Operation and Control	Power System-I & II	3	1	0	4
19.	BEE-44	Utilization & Traction	Electromechanical Energy Conversion-I& II	3	1	0	4
20.	BEE-46	Power Quality	Power System-I & II Power	3	1	0	4

			Electronics					
21.	BEE-40	Project Part-I	-	0	0	10	5	
22.	BEE-45	Industrial/Practical Training	-	0	0	2	1	
23.	BEE-50	Project Part-II	Project Part-I	0	0	10	5	

Programme Electives (Electrical Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
PE1 for V Semester							
1.	BCS-36	Database Management System, Data Mining and Warehousing	-	3	1	0	4
2.	BCS-43	Network Security & Cryptography	-	3	1	2	5
3.	BEC-42	Digital Signal Processing	-	3	1	2	5
4.	BEC-14	Electromagnetic Field Theory	-	3	1	0	4
PE2 for VI Semester							
5.	BEE-51	High Voltage Engineering	Power System-I & II	3	1	0	4
6.	BEE-52	Intelligent Instrumentation	Electrical Measurement & Measuring Instruments	3	1	0	4
7.	BEE-53	Digital Control System	Control System Engineering	3	1	0	4
8.	BEE-54	Conventional and CAD of Electrical Machines	Electromechanical Energy Conversion-I&II	3	1	2	5
PE3 for VII Semester							
9.	BCS-13	Object Oriented Techniques and JAVA Programming	-	3	1	0	4
10.	BEC-28	Principle of Communication	-	3	1	2	5
11.	BEE-55	EHV AC & DC Transmission	Power System-I & II	3	1	0	4
12.	BEE-56	Advanced Microprocessors and Micro Controllers	Introduction to Microprocessors	3	1	2	5
PE4 for VIII Semester							
13.	BEE-57	Modern Control System	Digital Control System	3	1	0	4
14.	BEE-58	SCADA & Energy Management System	Power System-I&II	3	1	0	4
15.	BEE-59	Energy Efficiency & Conservation	Power System-I&II	3	1	0	4
16.	BEE-60	Bio Instrumentation	-	3	1	0	4

Subjects offered for other departments

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BEE-01	Principles of Electrical Engineering	-	3	1	2	5
2.	BEE-16	Electromechanical Energy Conversion	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	2	5
3.	BOE-10	Non-Conventional Energy Sources	-	2	1	0	3
4.	BOE-11	Fundamentals of Electric Drives	-	2	1	0	3

Audit Courses for B. Tech. (Electrical Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
Year-I							
1.	BAS-05	Environment & Ecology	-	2	1	0	3

2.	BCS-01	Introduction to Computer Programming	-	2	1	2	4
3.	BAS-06	Space Sciences	-	2	1	0	3
Year-II							
4.	BAS-22	Nano Technology	-	2	1	0	3
5.	BCS-33	Web Technology	-	3	1	2	5
6.	MAS-109	Foreign Language-French	-	2	1	0	3
7.	MAS-110	Foreign Language-German	-	2	1	0	3
8.	MAS-111	Foreign Language-Spanish	-	2	1	0	3
Year-III							
9.	BCS-68	Neural Network & Fuzzy Systems	-	3	1	0	4
10.	BCS-14	Database Management System	-	3	1	2	5

ELECTRONICS & COMMUNICATION ENGINEERING DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

Credit Structure for B.Tech. Electronics & Communication Engineering
(For newly admitted students from Session 2014-2015)

Category	Semesters	I	II	III	IV	V	VI	VII	VIII	Total
Basic Sciences & Maths (BSM)		9	14	9	4	-	-	-	-	36
Engineering Fundamentals (EF)		12	7	7	2	-	-	-	-	28
Department Core (DC)		-	-	9	13	20	23	9	5	78
Management (M)		-	-	-	4	3	-	-	-	7
Humanities & Social Science Core (HSSC)		4	-	-	-	-	-	-	-	4
Project (P)		-	-	-	-	-	-	5	5	10
Programme Electives (PE)		-	-	-	-	-	-	8	9	17
Open Electives (OE)		-	-	-	-	-	-	-	4	4
Humanities & Social Science Electives (HSSE)		-	3	-	-	-	-	-	-	3
Total		25	24	25	23	23	23	22	23	188

Curriculum for B.Tech. (Electronics & Communication Engineering)

Freshman Year, Semester: I

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-02	Engineering Physics-I	3	1	2	5
2.	EF	BEC-01	Fundamentals of Electronics Engineering	3	1	2	5
3.	BSM	BAS-01	Engineering Mathematics-I	3	1	0	4
4.	EF	BEE-02	Electrical Circuits & Analysis	3	1	2	5
5.	HSSC	BAS-03	Professional Communication	3	1	0	4
6.	EF	BEC-10	Electronics Workshop & PCB	0	0	4	2
7.	AC	BAS-05	Environment and Ecology	2	1	0	-
Total				15	5	10	25

Freshman Year, Semester: II

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-08	Engineering Physics-II	3	1	2	5
2.	BSM	BAS-09	Engineering Chemistry	3	1	2	5
3.	BSM	BAS-07	Engineering Mathematics-II	3	1	0	4
4.	HSSE	BAS-**	Humanities & Social Science Electives	2	1	0	3
5.	EF	BCS-01	Introduction to Computer Programming	3	1	2	5
6.	EF	BCE-10	Engineering Graphics	0	0	4	2
7.	AC	MBA-HR6	Knowledge Management	2	1	0	-
Total				14	5	10	24

Sophomore Year, Semester-III

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-21	Engineering Mathematics-III	3	1	0	4
2.	EF	BEE-16	Electromechanical Energy Conversion	3	1	2	5
3.	BSM	BAS-28	Solid State Physics	3	1	2	5
4.	DC	BEC-11	Network Analysis & synthesis	3	1	0	4

5.	DC	BEC-12	Digital Electronics & Circuits	3	1	2	5
6.	EF	BAS-20	Communication Skills	0	0	4	2
7.	AC	BAS-22	Nano Technology	2	1	0	-
Total				15	5	10	25

Sophomore Year, Semester-IV

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-23	Engineering Mathematics-IV	3	1	0	4
2.	DC	BEC-13	Signals & Systems	3	1	0	4
3.	DC	BEC-14	Electromagnetic Field Theory	3	1	0	4
4.	DC	BEC-15	Solid State Devices & Circuits	3	1	2	5
5.	M	MBA-03	Public Administration	3	1	0	4
6.	EF	BCS-52	Web Designing	0	0	4	2
7.	AC	MBA-01	Industrial Management	2	1	0	-
Total				15	5	6	23

Junior Year, Semester-V

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	M	MBA-02	Industrial Economics and Management	2	1	0	3
2.	DC	BEC-26	Control Systems	3	1	2	5
3.	DC	BEC-27	Analog Integrated Circuits	3	1	2	5
4.	DC	BEC-28	Principles of Communication	3	1	2	5
5.	DC	BEC-29	Electronics Measurement & Instrumentation	3	1	2	5
6.	AC	BOE-03	Operation Research	3	1	0	-
Total				14	5	8	23

Junior Year, Semester-VI

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BEC-31	Digital Communication	3	1	2	5
2.	DC	BEC-32	Microprocessors & Application	3	1	2	5
3.	DC	BEC-33	Data Communication Networks	3	1	0	4
4.	DC	BEC-34	Microwave Engineering	3	1	2	5
5.	DC	BEC-35	VLSI Technology	3	1	0	4
6.	AC	BEC-30	Seminar	0	0	6	-
Total				15	5	6	23

Senior Year, Semester-VII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BEC-41	VLSI Design	3	1	2	5
2.	DC	BEC-42	Digital Signal Processing	3	1	0	4
3.	PE1	BEC-**	Program Elective-1	3	1	0	4
4.	PE2	BEC-**	Program Elective-2	3	1	0	4
5.	P	BEC-40	Project Part-I	0	0	10	5
6.	AC	BEC-45	Industrial/ Practical Training	0	0	2	-
Total				12	4	12	22

Senior Year, Semester-VIII

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BEC-43	Wireless Communication	3	1	2	5
2.	PE3	BEC-**	Program Elective-3	3	1	2	5
3.	PE4	BEC-**	Program Elective-4	3	1	0	4
4.	OE	BOE-**	Open Elective	3	1	0	4

5.	P	BEC-50	Project Part-II	0	0	10	5
Total				12	4	12	23

Engineering Fundamentals & Department Core (Electronics & Communication Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
Year-I							
1.	BEC-01	Fundamentals of Electronics Engineering	-	3	1	2	5
2.	BEC-10	Electronics Workshop & PCB	-	0	0	4	2
Year-II							
3.	BEC-11	Network Analysis & Synthesis	-	3	1	0	4
4.	BEC-12	Digital Electronics & Circuits	-	3	1	2	5
5.	BEC-13	Signals & Systems	-	3	1	0	4
6.	BEC-14	Electromagnetic Field Theory	-	3	1	0	4
7.	BEC-15	Solid State Devices & Circuits	Solid State Devices & Circuits	3	1	2	5
Year-III							
8.	BEC-26	Control Systems	-	3	1	2	5
9.	BEC-27	Analog Integrated Circuits	-	3	1	2	5
10.	BEC-28	Principles of Communication	Signals & Systems	3	1	2	5
11.	BEC-29	Electronics Measurement & Instrumentation	-	3	1	2	5
12.	BEC-31	Digital Communication	Principles of Communication	3	1	2	5
13.	BEC-32	Microprocessors & Application	Digital Electronics & Circuits	3	1	2	5
14.	BEC-33	Data Communication Networks	Principles of Communication	3	1	0	4
15.	BEC-34	Microwave Engineering	Electromagnetic Field Theory	3	1	2	5
16.	BEC-35	VLSI Technology	-	3	1	0	4
17.	BEC-30	Seminar	-	0	0	6	3
Year-IV							
18.	BEC-41	VLSI Design	VLSI Technology	3	1	2	5
19.	BEC-42	Digital Signal Processing	Signals & Systems	3	1	0	4
20.	BEC-40	Project Part-I	-	0	0	10	5
21.	BEC-45	Industrial/ Practical Training	-	0	0	2	1
22.	BEC-43	Wireless Communication	Principles of Communication	3	1	2	5
23.	BEC-50	Project Part-II	Project Part-I	0	0	10	5

Programme Electives (Electronics & Communication Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
PE1 & PE2 (VII Semester)							
1.	BEC-51	RADAR Technology	Electromagnetic Field Theory	3	1	0	4
2.	BEC-52	Biomedical Instrumentation	Fundamentals of Electronics Engineering	3	1	0	4
3.	BEC-53	Information Theory & Coding	Digital Communication	3	1	0	4
4.	BEC-54	Advanced Semiconductor Devices	Solid State Devices &	3	1	0	4

5.	BEC-55	Optoelectronics	Circuits Solid State Devices & Circuits	3	1	0	4
6.	BEC-56	Electronics Switching	-	3	1	0	4
7.	BEC-57	Microcontroller & Embedded Systems	Digital Electronics & Microprocessors	3	1	0	4
8.	BEC-58	Satellite Communications	Principles of Communication	3	1	0	4
PE3 (VIII Semester)							
9.	BEC-61	Digital System Design Using VHDL	Digital Electronics & Circuits	3	1	2	5
10.	BEC-62	Optical Communications	Principles of Communication	3	1	2	5
11.	BEC-63	DSP Architecture & Applications	Digital Signal Processing & Microprocessor	3	1	2	5
12.	BEC-64	Antenna Design	Electromagnetic Field Theory	3	1	2	5
PE4 (VIII Semester)							
13.	BEC-65	Digital Image Processing	Signals & Systems, DSP	3	1	0	4
14.	BEC-66	ATM Networks and B-ISDN	Data Communication Networks	3	1	0	4
15.	BEC-67	RF ICs	Analog Integrated Circuits	3	1	0	4
16.	BEC-68	Neural Networks	-	3	1	0	4

Subjects offered for other departments

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BOE-13	Industrial Automation & Robotics	-	2	1	0	3
2.	BOE-14	Industrial Electronics	Electronics measurements & Instrumentation	2	1	0	3
3.	BOE-15	Electronic Product Design	Fundamentals of Electronics Engg., PCB Design	2	1	0	3

Humanities & Social Science Electives

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BAS-10	Technical Writing	-	2	1	0	3
2.	BAS-11	Human Values & Professional Ethics	-	2	1	0	3
3.	BAS-12	Industrial Psychology	-	2	1	0	3

MECHANICAL ENGINEERING DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

Credit Structure for B. Tech. Mechanical Engineering (ME)

(For newly admitted students from Session 2014-2015)

Category	Semesters	I	II	III	IV	V	VI	VII	VIII	Total
Basic Sciences & Maths (BSM)		14	9	9	5	-	-	-	-	37
Engineering Fundamentals (EF)		7	12	6	2	-	-	-	-	26
Department Core (DC)		-	-	9	14	20	22	10	5	80
Management (M)		-	-	-	3	3	-	-	-	6
Humanities & Social Science Core (HSSC)		-	4	-	-	-	-	-	-	4
Project (P)		-	-	-	-	-	-	5	5	10
Programme Electives (PE)		-	-	-	-	-	-	8/9	8	16/17
Open Electives (OE)		-	-	-	-	-	-	-	4	4
Humanities & Social Science Electives (HSSE)		3	-	-	-	-	-	-	-	3
Total		24	25	24	24	23	22	23/24	22	186/187

Curriculum for B. Tech. (Mechanical Engineering)

Freshman Year, Semester-I

S.N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM	BAS-01	Engineering Mathematics-I	3	1	0	4
2.	BSM	BAS-02	Engineering Physics-I	3	1	2	5
3.	EF	BME-01	Engineering Mechanics	3	1	2	5
4.	HSSE	BAS-**	Humanities & Social Science Electives	2	1	0	3
5.	BSM	BAS-09	Engineering Chemistry	3	1	2	5
6.	EF	BCE-10	Engineering Graphics	0	0	4	2
7.	AC		Audit Course				-
Total				14	5	10	24

Freshman Year, Semester-II

S.N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM	BAS-07	Engineering Mathematics-II	3	1	0	4
2.	BSM	BAS-08	Engineering Physics-II	3	1	2	5
3.	HSSC	BAS-03	Professional Communication	3	1	0	4
4.	EF	BEE-01	Principles of Electrical Engineering	3	1	2	5
5.	EF	BCS-01	Introduction to Computer Programming	3	1	2	5
6.	EF	BME-10	Workshop Technology	0	0	4	2
7.	AC		Audit Course				-
Total				15	5	10	25

Sophomore Year, Semester-III

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-21	Engineering Mathematics-III	3	1	0	4
2.	BSM	BME-11	Material Science and Engineering	3	1	2	5
3.	EF	BME-12	Engineering Thermodynamics	3	1	0	4
4.	DC	BME-13	Measurement & Metrology	2	1	2	4
5.	DC	BME-14	Mechanics of Solids	3	1	2	5
6.	EF	BME-20	Mechanical Engineering Drawing	0	0	4	2
7.	AC		Audit Course				-
Total				14	5	10	24

Sophomore Year, Semester-IV

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	BSM	BAS-24	Applied Computational Methods	3	1	2	5
2.	M	MBA-01	Industrial Management	2	1	0	3
3.	DC	BME-16	Fluid Mechanics	3	1	2	5
4.	DC	BME-17	Kinematics of Machines	3	1	0	4
5.	DC	BME-18	Energy Conversion Systems	3	1	2	5
6.	EF	BAS-20	Communication Skills	0	0	4	2
7.	AC		Audit Course				-
Total				14	5	10	24

Junior Year, Semester-V

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	M	MBA-02	Industrial Economics and Management	2	1	0	3
2.	DC	BME-26	Machine Design-I	3	1	2	5
3.	DC	BME-27	Heat and Mass Transfer	3	1	2	5
4.	DC	BME-28	Dynamics of Machines	3	1	2	5
5.	DC	BME-29	Manufacturing Science	3	1	2	5
6.	AC		Audit Course	3	1	0/2	-
Total				14	5	8	23

Junior Year, Semester-VI

S.N.	Category	Paper Code	Subject	L	T	P	Credits
1.	DC	BME-31	Machine Design-II	3	1	2	5
2.	DC	BME-32	Refrigeration & Air conditioning	3	1	2	5
3.	DC	BME-33	I C Engines and Compressors	3	1	0	4
4.	DC	BME-34	Machine Tools & Machining	3	1	0	4
5.	DC	BME-35	Principles of Industrial Engineering	3	1	0	4
6.	AC	BME-30	Seminar	0	0	6	-
Total				15	5	4	22

Senior Year, Semester-VII

S.N.	Category	Paper Code	Subject	L	T	P	Credit
1.	DC	BME-41	Automobile Engineering	3	1	2	5
2.	DC	BME-42	Computer Aided Design	3	1	2	5
3.	PE1	BME-**	Program Elective-1	3	1	0/2	4/5
4.	PE2	BME-**	Program Elective-2	3	1	0	4
5.	P	BME-40	Project Part-I	0	0	10	5

6.	AC	BME-45	Industrial/Practical Training	0	0	2	-
Total				12	4	14/16	23/24

Senior Year, Semester-VIII

S.N.	Category	Paper Code	Subject	L	T	P	Credit
1.	DC	BME-43	Computer Aided Manufacturing	3	1	2	5
2.	PE3	BME-**	Program Elective-3	3	1	0	4
3.	PE4	BME-**	Program Elective-4	3	1	0	4
4.	OE	BOE-**	Open Elective	3	1	0	4
5.	P	BME-50	Project Part-II	0	0	10	5
Total				12	4	12	22

Engineering Fundamentals & Department Core (Mechanical Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
Year-I							
1.	BME-01	Engineering Mechanics	-	3	1	2	5
2.	BME-03	Manufacturing Processes	-	3	1	0	4
3.	BME-10	Workshop Technology	-	0	0	4	2
Year-II							
4.	BME-11	Material Science and Engineering	-	3	1	2	5
5.	BME-12	Engineering Thermodynamics	-	3	1	0	4
6.	BME-13	Measurement & Metrology	-	2	1	2	5
7.	BME-14	Mechanics of Solids	-	3	1	2	5
8.	BME-16	Fluid Mechanics	-	3	1	2	5
9.	BME-17	Kinematics of Machines	-	3	1	0	4
10.	BME-18	Energy Conversion Systems	-	3	1	2	5
11.	BME-20	Mechanical Engineering Drawing	Engineering Graphics	0	0	4	2
Year-III							
12.	BME-26	Machine Design-I	Mechanics of Solids	3	1	2	5
13.	BME-27	Heat and Mass Transfer	Engineering Thermodynamics	3	1	2	5
14.	BME-28	Dynamics of Machines	Kinematics of Machines	3	1	2	5
15.	BME-29	Manufacturing Science	Manufacturing Processes	3	1	2	5
16.	BME-30	Seminar	-	0	0	6	3
17.	BME-31	Machine Design-II	Mechanics of Solids	3	1	2	5
18.	BME-32	Refrigeration & Air conditioning	Heat and Mass Transfer	3	1	2	5
19.	BME-33	I C Engines and Compressors	Engineering Thermodynamics	3	1	0	4
20.	BME-34	Machine Tools & Machining	Manufacturing Science	3	1	0	4
21.	BME-35	Principles of Industrial Engineering	-	3	1	0	4
Year-IV							
22.	BME-40	Project Part-I	-	0	0	10	5
23.	BME-41	Automobile Engineering	I C Engines and Compressors	3	1	2	5
24.	BME-42	Computer Aided Design	-	3	1	2	5
25.	BME-43	Computer Aided Manufacturing	Manufacturing Science	3	1	2	5
26.	BME-45	Industrial/Practical Training	-	0	0	2	1
27.	BME-50	Project Part-II	Project Part-I	0	0	10	5

Programme Electives (Mechanical Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
PE1 & PE2 (VII Semester)							
1.	BME-51	Hydraulic Machines	Fluid Mechanics	3	1	2	5
2.	BME-52	Principles of Machine Tools Design	Manufacturing Science	3	1	0	4
3.	BME-53	Production Planning & Control	Principles of Industrial Engineering	3	1	0	4
4.	BME-54	Industrial Tribology	-	3	1	0	4
5.	BME-55	Total Quality Management	Principles of Industrial Engineering	3	1	0	4
6.	BME-56	Energy Management	-	3	1	0	4
7.	BME-57	Mechanical Vibrations	-	3	1	0	4
8.	BME-58	Renewable Energy systems	Engineering Thermodynamics	3	1	0	4
PE3 & PE4 (VIII Semester)							
1.	BME-61	Power Plant Technologies	Engineering Thermodynamics	3	1	0	4
2.	BME-62	Turbo Machinery	Engineering Thermodynamics	3	1	0	4
3.	BME-63	Project Management	-	3	1	0	4
4.	BME-64	Advanced Welding Technology	Manufacturing Science	3	1	0	4
5.	BME-65	Advanced Manufacturing Technology	Manufacturing Science	3	1	0	4
6.	BME-66	Advanced Engineering Materials	Material Science and Engineering	3	1	0	4
7.	BME-67	Advanced Mechanics of Solids	Mechanics of Solids	3	1	0	4
8.	BME-68	Gas Dynamics and Propulsion	Fluid Mechanics	3	1	0	4

Subjects offered for other departments

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BME-02	Fundamentals of Mechanical Engineering	-	3	1	2	5
2.	BME-15	Engineering Materials	-	3	1	2	5
3.	BOE-16	Quality Management	-	2	1	0	3
4.	BOE-17	Reliability & Maintenance Engineering	-	2	1	0	3
5.	BOE-18	Industrial Pollution & Control	-	2	1	0	3

Humanities & Social Science Electives (Mechanical Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BAS-11	Human Values & Professional Ethics	-	2	1	0	3
2.	BAS-12	Industrial Psychology	-	2	1	0	3
3.	BAS-13	Industrial Sociology	-	2	1	0	3

Audit Courses for B. Tech. (Mechanical Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
Year-I							
1.	BAS-04	Environmental Chemistry	-	3	1	0	4
2.	BAS-05	Environment & Ecology	-	2	1	0	3
3.	BEC-01	Fundamentals of Electronics Engineering	-	3	1	2	5
4.	BAS-06	Space Sciences	-	2	1	0	3
Year-II							
1.	BAS-22	Nano Technology	-	2	1	0	3
2.	BEE-16	Electromechanical Energy Conversion	-	3	1	2	5

3.	BEE-15	Introduction to Microprocessors	-	3	1	2	5
4.	MAS-109	Foreign Language-French	-	2	1	0	3
5.	MAS-110	Foreign Language-German	-	2	1	0	3
6.	MAS-111	Foreign Language-Spanish	-	2	1	0	3
Year-III			-				
1.	BCS-68	Neural Network & Fuzzy Systems	-	3	1	0	4
2.	BCE-21	Environmental Impact Assessment & Management	-	3	1	0	4
3.	BCS-14	Database Management System	-	3	1	2	5

Section C

SYLLABI

**APPLIED SCIENCE DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR**

SUBJECTS OFFERED BY THE DEPARTMENT

S.N.	Paper Code	Subject	Prerequisite subject	L	T	P	Credits
Under Graduate Programme							
Year-I							
			-				
1.	BAS-01	Engineering Mathematics-I	-	3	1	0	4
2.	BAS-02	Engineering Physics-I	-	3	1	2	5
3.	BAS-03	Professional Communication	-	3	1	0	4
4.	BAS-04	Environmental Chemistry	-	3	1	0	4
5.	BAS-05	Environment & Ecology	-	2	1	0	3
6.	BAS-06	Space Sciences	-	2	1	0	3
7.	BAS-07	Engineering Mathematics-II	-	3	1	0	4
8.	BAS-08	Engineering Physics-II	-	3	1	2	5
9.	BAS-09	Engineering Chemistry	-	3	1	2	5
10.	BAS-10	Technical Writing	-	2	1	0	3
11.	BAS-11	Human Values & Professional Ethics	-	2	1	0	3
12.	BAS-12	Industrial Psychology	-	2	1	0	3
13.	BAS-13	Industrial Sociology	-	2	1	0	3
14.	BAS-14	Graph Theory	-	3	1	0	4
Year-II							
1.	BAS-20	Communication Skills	-	0	0	4	2
2.	BAS-21	Engineering Mathematics-III	-	3	1	0	4
3.	BAS-22	Nano Technology	-	2	1	0	3
4.	BAS-23	Engineering Mathematics-IV	-	3	1	0	4
5.	BAS-24	Applied Computational Methods	-	3	1	2	5
6.	BAS-25	Probability Theory & Stochastic Process	-	3	1	0	4
7.	BAS-26	Optimization Techniques	-	3	1	0	4
8.	BAS-27	Discrete Mathematics	-	3	1	0	4
9.	BAS-28	Solid State Physics	-	3	1	2	5

SYLLABI

BAS-01	ENGINEERING MATHEMATICS-I	4 Credits (3-1-0)
UNIT I		9
Differential Calculus: Leibnitz theorem, Partial derivatives, Euler's theorem for homogenous function, Total derivative, Change of variable. Taylor's and Maclaurin's theorem, Expansion of function of two variables, Jacobian, Extrema of function of several variables		
UNIT II		9
Linear Algebra: Rank of Matrix, Inverse of a Matrix, Elementary transformation, Consistency of linear system of equations and their solution. Characteristic equation, Eigen-values, Eigen-vectors, Cayley-Hamilton theorem		
UNIT III		9

Multiple Integrals: Double and triple integrals, change of order of integration, change of variables. Application of multiple integral to surface area and volume, Beta and Gamma functions, Dirichlet integral

UNIT IV

9

Vector Calculus: Gradient, Divergence and Curl. Directional derivatives, line, surface and volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without Proofs)

Books & References:

1. Higher Engineering Mathematics - B.S. Grewal, Khanna Publishers
2. Engineering Mathematics - H.K. Dass and Rama Verma, S. Chand Publications
3. Engineering Mathematics - N.P. Bali and Manish Goel, Laxmi Publications
4. Engineering Mathematics - D. Kandu, Neel Kamal Prakashan
5. Higher Engineering Mathematics - B.V. Ramana, Tata McGraw Hill Education Pvt. Ltd., New Delhi

BAS-02

ENGINEERING PHYSICS-I

5 Credits (3-1-2)

UNIT I

9

Relativistic Mechanics: Inertial and Non-inertial Frames of reference, Galilean transformation, Michelson-Morley Experiment, Postulates of special theory of relativity, Lorentz Transformation, Length contraction, Evidences of length contraction, Time dilation, Evidences for time dilation, Relativistic velocity transformation, Relativistic variation of mass with velocity, Evidence of mass variation with velocity, Relativistic kinetic energy, Mass energy equivalence, Examples from nuclear physics, Relativistic energy-momentum relation.

UNIT II

9

Statistical Mechanics: Brief Introduction of Classical Statistics, Bose Einstein Statistics, Application to Black body radiation, distribution law of energy, Planck's radiation formula and Stefan's law. Fermi – Dirac statistics, Application to electrons in metals (energy distribution, Fermi energy).

Quantum Mechanics: De Broglie waves and Group velocity concept, Uncertainty principle and its application, Davisson-Germer experiment, Derivation of Schrodinger equation for time independent and time dependent cases. Postulates of quantum mechanics, Significance of wave function, Application of Schrodinger wave equation for a free particle (one dimensional and three dimensional case), Particle in a box (one dimensional and three dimensional), Simple harmonic oscillator (one dimensional and three dimensional).

UNIT III

9

Geometrical Optics: General theory of image formation: Cardinal points of an optical system; general relationships, thick lens and lens combinations.

Optical instruments: Need for a multiple lens eyepiece, common type of eyepieces

Physical Optics:

Interference: Interference of light, Interference in thin films (parallel and wedge shaped film), Newton's rings.

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Polarimeter

UNIT IV

9

Modern Optics

Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications.

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Propagation Mechanism and communication in fiber Single and Multi Mode Fibers, step index and graded index fiber, attenuation and losses.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

EXPERIMENTS

1. To determine the wavelength of monochromatic light by Newton's Ring
2. To determine the specific rotation of cane sugar solution using polarimeter
3. To determine the wavelength of spectral lines using plane transmission grating.
4. To verify Brewster's law using rotating Nicol prism
5. To verify Stefan's law by electrical method
6. To Study resonance in LCR circuit with a c source.

7. To determine the height of a tower with a Sextant.
8. To determine the refractive index of a liquid by Newton's ring.

Books & References:

1. Introduction to Special theory Relativity-Robert Resnick, Wiley Eastern Ltd.
2. Statistical Mechanics and Properties of Matter- E S R Gopal, John Wiley and Sons
3. Quantum Mechanics: Theory and Applications- Ajoy Ghatak, Tata McGraw-Hill
4. Optics- Ajoy Ghatak, Tata McGraw-Hill
5. Optics- N. Subrahmanyam, Brij Lal, M.N. Avadhanulu, S.Chand
6. Fiber optics and laser Principles and Applications-Anuradha De, New Age International
7. Concepts of Modern Physics-Arthur Beiser , Tata McGraw-Hill

BAS-03	PROFESSIONAL COMMUNICATION	4 Credits (3-1-0)
---------------	-----------------------------------	--------------------------

UNIT I

9

Communication: Principles of Communication – Communication as coding and decoding – signs and symbols – verbal and non-verbal symbols – Language AND communication; language VS communication, language as a tool of communication – media/channels for communication : Types of Communication- functional, situational, verbal and non-verbal, interpersonal, group, interactive, public, mass line, dyadic – with illustrations LSRW in Communication – Listening – active vs passive (Talk less, listen more); Speaking - Speech vs. enunciation (mind your tone); Reading –Focus on the structure not on the theme alone, Technical Communication, General Communication, Barriers of Communication, Levels of Communication

UNIT II

Language Acquisition through Grammar, Usage and Mechanics of Writing:

9

Vocabulary, Phrase, Clause, Parts of Speech: Types ,Examples with Use Gender, Singular, Plural, Article, Sequence of Tenses, Use of Modifiers, Sentence-Loose Sentence, Periodical Sentence, Topic Sentence, Paragraph-Different Orders and Methods of Paragraph Writing, Inductive Method, Deductive Method, Spatial Method, Question and Answer Method, Chronological Method, Expository Method, Common Errors, Antonyms, Synonyms, One- word Substitutes, Homophone, Homonym, Comprehension and Précis, Words Frequently Misspelt, Punctuation and Capitalization, Abbreviations and Numerals ,Proofreading, Using the Library

UNIT III

9

Technical Writing: Report Writing: Meaning, Types, Structure, Methods and Models of Report Writing, Technical Proposal; Concept, Kinds, Layout, and Examples of Technical Proposal, Definitions, Characteristics, Structure, Letter Writing: Importance, Types, Layout, and examples of letters, Scientific and Technical Writing: Features, Methods, Examples, Project, Thesis and Dissertation Writing

UNIT IV

9

Spoken and Presentation Skills: Impromptu speech – tackling hesitation, shyness and nervousness in speaking – Public speaking, academic and professional presentations – Group discussions – facilitators and impediments Planning, preparing and delivering a presentation, essentials of presentation - etiquette; clarity; lively delivery – Speech generation; speech rhythm; speech initiators body language – voice, posture and gesture; eye contact; dress codes; verbal crutches; stresses, pronunciation – contextualisation – creating and understanding contexts, Speech Drill.

Books & References:

1. Complete Course in English - Dixon Robert J., Prentice Hall of India, New Delhi
2. A Practical English Grammar - Thomsom and Martinet, ELBS
3. English Pronouncing Dictionary - Jones Daniel, Paperback
4. Spoken English - Bansal R.K. &Harrison J.B., Orient Longman, India
5. Handbook of Pronunciation of English Words - Sethi J. & Jindal D.V.A, Prentice Hall of India, New Delhi
6. Word Power Made Easy - Lewis, Norman, Pocket Books
7. Business Correspondence and Report Writing - Sharma R.C. & Mohan Krishna, Tata McGraw Hill
8. Business Communication - Chhabra T.N., Sun India Publication, New Delhi

UNIT I **9**
Basic concept of Environmental chemistry, Introduction to atmospheric chemistry, Layers of the atmosphere and their chemical composition, chemistry of gaseous and particulate pollutants, Stratospheric ozone depletion, Ozone Holes, stratospheric ozone chemistry, Fossil fuel burning, CO₂ emissions, Greenhouse Effect Tropospheric air pollution, concept of fog and smog, Consequences of air pollution. The Human Health Effects of Outdoor Air Pollutants

UNIT II **9**
The Chemistry of Natural Waters, Oxidation-Reduction Chemistry in Natural Waters, Ion Concentrations in Natural Waters and Drinking Water, Water Pollution and Purification of Water, Water Disinfection, Desalination of Salty Water, Groundwater: Its Supply, Chemical Contamination, and Remediation The Chemical Contamination and Treatment of Wastewater and Sewage. Management of water resources.

UNIT III **9**
Toxic Heavy Metals, Mercury, Lead, Arsenic and chromium, Soil pollution, Domestic and Commercial Garbage: Its Disposal and Minimization. The Recycling of Household and Commercial Waste, Hazardous Wastes and methods of disposal

UNIT IV **9**
Toxic Organic Compounds, Pesticides, Insecticides, Herbicides, Dioxins, Furans, and PCBs, Polynuclear Aromatic Hydrocarbons Chemistry of food additives, dyes, detergents and bleaching agents

Books & References:

1. Environmental Chemistry - Colin Baird and Michael Cann, W. H. Freeman
2. Environmental Chemistry - Stanley E. Manahan, CRC Press; 9th edition

UNIT I **6**
The Multidisciplinary nature of environmental studies, Definition, scope and importance, Need for public awareness. Natural Resources, Renewable and non-renewable resources, Natural resources and associated problems

- (a) Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining.
- (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources,
- (d) Food resources: World food problem, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
- (e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.

UNIT II **6**
Ecosystems
Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids
Introduction, types, characteristic features, structure and function of the following ecosystem: (a) Forest ecosystem (b) Grassland Ecosystem (c) Aquatic ecosystems (ponds, rivers, oceans)

Biodiversity
Introduction- Definition : genetic, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity: habitat loss, Endangered and endemic species of India, Conservation of biodiversity:

UNIT III **6**
Environmental Pollution Causes, effects and control measures of-

(a) Air Pollution. (b) Water Pollution. (c) Soil Pollution (d) Marine Pollution. (e) Noise Pollution. (f) Thermal Pollution.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution

Global warming and green house effect, Acid Rain, Ozone Layer depletion

UNIT IV

6

Environmental Protection- Role of Government, Legal aspects, Initiatives by Non-governmental Organizations (NGO), Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

Human Population and the Environment

Population growth, Population explosion- Family Welfare Programme, Environment and human health, Environmental Education, Women Education., Women and Child Welfare

Books & References:

1. Environmental Studies - J Krishnawamy , R J Ranjit Daniels, Wiley India
2. Environmental Science - Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall
3. Environment and Ecology - R K Khandal, 978-81-265-4277-2, Wiley India
4. Environmental Science – 8th edition ISV, Botkin and Keller, 9788126534142, Wiley India
5. Environmental Studies - Soli. J Arceivala, Shyam, R Asolekar, McGrawHill India, 2012
6. Environmental Studies - D.L. Manjunath, 9788131709122 Pearson Education India, 2007

BAS-06

SPACE SCIENCE

3 Credits (2-1-0)

UNIT I

6

Observational Astronomy: Introduction ancient age astronomy and the scientific revolution of Copernicus and Galileo, Astronomical techniques: Telescope, its construction, functioning, resolving and its light gathering power, Use of balloon for observations on earth, Requirement of rocket and satellite technology, Charge Couple Device (CCD) as an optical detection system, An overview of Radio, infrared, microwave, ultra-violet, X-rays & γ –rays telescope with specific examples and their pioneering breakthroughs, An overview of near earth and space explorations using satellite, robotic and manned missions, Gravitational redshift by sun, clock rates in satellites, Gravitational lensing, Perihelion motion of mercury, Importance of observational astronomy and telecommunication.

UNIT II

6

Our Solar System: Origin of our solar system, Sun and its theoretical model, Energy production inside stars: proton-proton chain & CNO cycle, Sun's chromosphere, Solar storm and the solar wind, Neutrinos from Sun, The description of eight planets and their moons with their atmospheric and geographical conditions & vital statistics, Removal of Pluto from the list of nine planets, Classification of planets, The green house effect, Existence in favor water in remote past of mars, Other planetary bodies: Asteroids, comets and meteorites, The cosmic dust, Oort cloud and the Kuiper's belt, The great comet crash: Shoemaker-Levy, Types of asteroids and their properties, The direct and indirect spectroscopy.

Titus-Bode law, Kepler's laws of planetary motion, Newton's law of gravitation from Kepler's law of planetary motion

UNIT III

6

(a) **Stars and their classification:** Harvard classification of stars, Morgan-Keenan system, spectral classification of stars, The Hertzsprung-Russel diagram: main sequence stars, red and super-red giants, dwarf stars and black holes, Sun's evolution in H-R diagram, The Schwarzschild solution: massive stars, singularity and the black holes, Loss of information from a black hole, Accretion of mass and emission of jets in a binary star system: neutron star, black hole, Theory of compact stars: White dwarf stars and neutron stars; their evolution and equilibrium.

(b) **Large celestial bodies:** Our galaxy, Types of galaxies: Elliptical, Spiral and SO type of galaxies, Irregular galaxies, their morphology, evolution and contents, Hubble's tuning fork diagram, Cluster of galaxies and

their evolution, Collision and merger of galaxies, Active galaxies: Exploding galaxies, Seyfert galaxies, Quasars and pulsars etc.

UNIT IV

6

The Big-Bang Theory: The expanding universe: Hubble's law and constant, The flaw in Hubble's measurement, The hot big-bang model: arguments in its favor and against, The evolution of the universe after big-bang: description of different phases, matter, energy and forces, Models of the Universe: the closed, open and flat models and their relevance with observations, Origin of various bands of electromagnetic bands of spectrum in Universe, COBE: black body spectrum of the Universe, The existence of dark matter and dark energy: composition, Role of dark matter and dark energy in evolution of Universe, Cosmic rays, Creation of mass and the God particle.

Books & References:

1. Introduction to Cosmology- J. V. Narlikar, Cambridge University Press
2. Introduction to Special Relativity and Space Science - Satya Pal Singh, Wiley India Pvt. Ltd., New Delhi
3. Observational Astronomy - D. Scott Birney, Guillermo Gonzalez and David Oesper, Cambridge University Press.
4. Observational Astronomy: Technique and Instrumentation - Edmund C Sutton, Cambridge University Press
5. 100 Billion Suns: The Birth, Life and Death of Stars - Kippenhahn R, Weidenfeld and Nicolson

BAS-07

ENGINEERING MATHEMATICS-II

4 Credits (3-1-0)

UNIT I

9

Differential Equations: Linear differential equations with constant coefficients (n^{th} order), complementary function and particular integral. Simultaneous linear differential equations, solution of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications of differential equations to engineering problems

UNIT II

9

Special functions: Series solution of second order differential equations with variable coefficient (Frobenius method). Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials

UNIT III

9

Laplace Transform: Laplace Transform, Laplace transform of derivatives and integrals. Unit step function, Laplace transform of Periodic function. Inverse Laplace transform, Convolution theorem, Applications to solve simple linear and simultaneous differential equations.

UNIT IV

9

Fourier Series and Partial Differential Equations: Periodic Functions, Fourier Series of period 2π , Change of interval, Even and Odd functions, Half range Sine and Cosine Series. Harmonic analysis, Partial Differential Equations with constant coefficients

Books & References:

1. Higher Engineering Mathematics - B.S. Grewal, Khanna Publishers
2. Engineering Mathematics - H.K. Dass and Rama Verma, S. Chand Publications
3. Engineering Mathematics - N.P. Bali and Manish Goel, Laxmi Publications
4. Higher Engineering Mathematics - B.V. Ramana, Tata McGraw Hill Education Pvt. Ltd., New Delhi

BAS-08

ENGINEERING PHYSICS-II

5 Credits (3-1-2)

UNIT I

9

Crystal Structures and X-ray Diffraction: Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Reciprocal Lattice, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer.

UNIT II**9**

Sound Waves and Acoustics: Sound waves, intensity, loudness, reflection of sound, echo; Reverberation, reverberation time, Sabine's formula, remedies over reverberation; Absorption of sound, absorbent materials; Conditions for good acoustics of a building; Noise, its effects and remedies; Ultrasonics – Production of ultrasonics by Piezo-electric and magnetostriction; Detection of ultrasonics; Engineering applications of Ultrasonics (Non-destructive testing).

UNIT III**9**

Electrodynamics –I: Basic concepts of Gauss's law, Ampere's law and Faraday's law of electromagnetic induction. Correction of Ampere's law by Maxwell (concept of displacement current), Maxwell's equation, transformation from integral form to differential form, physical significance of each equation

Electrodynamics –II: Maxwell's equation in free space, velocity of electromagnetic wave, transverse character of the wave and orthogonality of E, H and k vectors, Maxwell's equations in dielectric medium and velocity of e. m. wave, comparison with free space, Maxwell's equations in conducting media, solution of differential equation in this case and derivation of penetration depth

UNIT IV**9****Physics of Advanced Materials**

Semiconducting Materials: Concept of energy bands in solids, Carrier concentration and conductivity in intrinsic semiconductors and their temperature dependence, carrier concentration and conductivity in extrinsic semiconductors and their temperature dependence. Hall effect in semiconductors, Compound semiconductors, Optoelectronic Materials.

Superconducting Materials: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, Electrodynamics of superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Superconductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

EXPERIMENTS

1. To determine the specific resistance of a given wire using Carrey Foster's Bridge.
2. To study the variation of magnetic field along the axis of current carrying circular coil.
3. To study the Hall's effect and to determine Hall coefficient in n type Germanium.
4. To study the energy band gap of n- type Germanium using four probe method
5. To determine e/m of electron using Magnetron valve
6. To draw hysteresis curve of a given sample of ferromagnetic material
7. To determine the velocity of Ultrasonic waves
8. To determine the Elastic constants (Y, η, σ) by Searls method

Books & References:

1. Introduction to Solid State Physics- Kittel , 7th edition, Wiley Eastern Ltd.
2. Solid State Physics - S. O. Pillai, 5th edition, New Age International.
3. Introduction to Electrodynamics- David J. Griffiths Pearson, New International Edition
4. Semiconductor Devices and Application - S.M. Sze, Wiley
5. Introduction to Nano Technology - Poole Owens, Wiley India
6. Master Hand book of Acoustics - F. Alton Everest and Ken Pohlmann, 5th edition, McGraw Hill

BAS-09**ENGINEERING CHEMISTRY****5 Credits (3-1-2)**

UNIT I**9**

Molecular orbital theory, LCAO approximation, MO diagrams of diatomic molecules. Band theory of metallic bond, Hydrogen bonding, Structure of graphite and fullerene- C_{60} , Liquid crystallite state, classification and applications of liquid crystals, Types of unit cell, space lattice (only cubes), Bragg's Law, Calculation and density of the cubic unit cell, Phase Rule and its application to water system.

UNIT II**9**

Inductive, mesomeric and hyperconjugative effects, Stability of reactive intermediates, e.g. Carbocation, Carbanion and free radicals, Types of organic reactions, & Mechanism of nucleophilic substitution & elimination reactions, Mechanism of organic name reactions (Cannizzaro reaction, Aldol condensation, Pinacol-pinacol rearrangement, Beckmann rearrangement, Hoffmann rearrangement & Diels Alder Reaction)

Stereosomerism of organic compounds containing one & two chiral centers. Enantiomers & diastereomers, R-S & E-Z Nomenclature, Examples of optically active compounds without chiral centre, Conformations of butane

UNIT III

9

Introduction & classification of polymers, Chain and Step growth polymerization, Thermoplastic and Thermosetting resins, Elastomers and synthetic fibres, Mechanism of chain polymerization, Stereoregular polymers, Synthesis and applications of: Polyethylene, Polypropylene, PVC, PMMA, PAN, PET, Polyamides, Polyurethane, Natural and synthetic Rubbers, Phenol Formaldehyde Resin. Conducting & biodegradable polymers and their applications

Cement and its applications

Classification of Fuels, calorific value of fuel, gross & net calorific value, determination of calorific value using Bomb calorimeter

UNIT IV

9

Basic principles of spectroscopic methods, Basic principles of UV-Visible, IR, ¹H NMR & Mass spectroscopy, determination of structure of simple organic compounds.

Hardness of water, Softening of water (Zeolite process, Lime Soda process & Ion exchange process). Treatment of boiler feed water by Calgon process

EXPERIMENTS

1. Determination of iron content in the given sample using $K_3[Fe(CN)_6]$ as an external indicator.
2. Determination of temporary and permanent hardness in water sample using EDTA as standard solution.
3. Determination of alkalinity in the given water sample.
4. Determination of chloride content in the given water sample by Mohr's method.
5. Determination of percentage of available chlorine in bleaching powder sample.
6. pH-metric titration between strong acid and strong base.
7. Viscosity of a polymer like polystyrene by Viscometric method.
8. Element detection & functional group identification in organic compounds
9. Preparation of a polymer like Bakelite or PMMA.
10. Preparation of Sodium Cobaltinitrile salt.

Books & References:

1. Engineering Chemistry, Wiley India
2. Engineering Chemistry, Tata McGraw Hill
3. Concise Inorganic Chemistry - J.D. Lee; Wiley India
4. Organic Chemistry- Morrison & Boyd, 6th edition, Pearson Education
5. Physical Chemistry - Gordon M. Barrow; McGraw Hill
6. Physical Chemistry - Peter Atkins & Julio De Paula, Oxford University Press

BAS-10

TECHNICAL WRITING

3 Credits (2-1-0)

UNIT I

6

The Sentence, The paragraph: Structure, types and Linking, Technical Vocabulary, Impersonal Style, Scientific Attitude Plain Statement, Interesting Composition, Miscellaneous Exercises, Definition, Description, Description of a process, Diagrams, Explanations, Technical Communication-Simplicity, Clarity and Conciseness of a Presentation, Blending of Artistic and Technical Writing, Usages in Grammar, Comprehension—Reading Listening, Précis Writing

UNIT II

6

Thesis Elements-Front Matter of a Thesis, Main Text of a Thesis, End Matter of a Thesis, Paper Elements-Front Matter of a Paper, Main Text of a Paper, End Matter of a Paper, Order of a thesis and Paper Elements, Concluding Remarks Identification of Author and His Writing-Author's name and Affiliation, Joint Authorship of a Paper,

Identification of Writing-Title, Keywords, Synopsis, Preface and abstract, Specimen—Thesis and Research Paper, Chapters and Sections-Introductory Chapters and Sections, Statement of the Problems, Plan and Scope, Core Chapters and Sections-Theoretical Analysis and Synthesis, Basic Assumption and Hypothesis

UNIT III

6

Letter Writing_ Formal and Informal Letters, Parts of a Letter, Types of Letters, Business Letters, Examples of Letter-Writing, Job Applications, C.V and Resume Writing, Stylistic Faults in Letter Writing, Report Writing, Kinds of Reports, Length of Report, Parts of a Report, Terms of Reference, Collection of Facts, Outlines of Report, Examples of Report, Technical Proposal, Elements of Proposal, Examples of Proposal, drafting of proposal

UNIT IV

6

Technical seminar-purpose, modes and methods, Interviewing skills-body language, gesture, posture, tips and tactics of interview, resume making.

Case study- objectives, methods, examples of various case studies

Audience Analysis: Industrial vs. non-industrial users; Exploring primary, secondary, tertiary users in contexts of production and use; Creating personas; Multicultural issues; Analyzing real-world examples

Estimating, tracking, and managing tech writing projects. Determine the project scope, Estimates and schedules, Assemble the team, Provide resources and leadership, Evaluate the project, Appendixes and Annexure, References, Peripherals—Official Formalities, Rights and Permission, Certificate and Copyright, Dedication, Acknowledgement, Correspondences.

Project making: Making a final Project on topics, given by the instructor.

Books & References:

1. Technical Writing – O.P. Pandey, SK Kataria & sons
2. Interview Skills : Tips & Techniques – Anita Acharya, Yking Books
3. Managing Writers - Richard Hamilton, Penguin
4. Technical Writing Management: A Practical Guide - Steven A. Schwarzman
5. Technical Writing - R.S. Sharma, Radha Publications, New Delhi
6. Technical Writing - B.N. Basu, PHI Learning Pvt. Ltd., New Delhi
7. Lesikar and petit, Report writing for Business

BAS-11

HUMAN VALUES AND PROFESSIONAL ETHICS

3 Credits (2-1-0)

UNIT I

6

Origin, Meaning, and Definition of Value, Types of Values, Individual Value, Family Value, Societal Value, Human Value, Value in Education System, Understanding Happiness and Prosperity, Self Exploration and Natural Acceptance.

UNIT II

6

Harmony in family, Harmony in Society, Values Leading to Harmony, Creating a world family, Harmony in Nature, Environment and Sustainable Developmental, Legal aspects of Environment, Holistic Perspectives of Values, Existence and Co-existence

UNIT III

6

Origin, Meaning and Definition of Ethics, Ethics: The science of the Morality of The Art of Correct Living ,Ethics in Human Acts, Ethics and Religion, Ethical Norms and Laws ,Ethics in Literature ,Ethics in Science and Technology.

UNIT IV

6

Ethical Approaches: Theistic Approach, Atheistic Approach, General and Special Ethics, Professional Ethics: Ethics at work place, Ethics as Skill, Values and Ethics, Ethics with Value Education, Managerial and Business & Corporate Ethics, Corporate Social Responsibilities.

Books & References:

1. A foundation course in Human Values and Professional Ethics - G.P. Bangaria, R.R Gaur and R. Sangal, Excel Books.
2. Professional Ethics and Human Values - M. Govindrajan, S. Natrajan, S. Senthil Kumar, Eastern Economy Edition

3. Textbook on Professional Ethics and Human Values - R.S. Naagrazan, New Age International
4. Human values and Professional Ethics - Anuranjan Misra, Dr. R.K. Shukla, Amazon (Paper Back).
5. Business Ethics: An Indian Perspective - A.C. Fernando, Pearson, India

BAS-12 INDUSTRIAL PSYCHOLOGY 3 Credits (2-1-0)

UNIT I	6
Introduction to Industrial Psychology and its basic concepts: Nature, Importance and scope of Industrial Psychology, Scientific management, Time and motion study and human relations school.	
UNIT II	6
Individual in workplace: Motivation and job satisfaction, Stress management, Organisational culture, Leadership and group-dynamic.	
UNIT III	6
Work environment, Recruitment and selection: Engineering Psychology, Fatigue and boredom, Work environment, Accident and safety, Job-analysis, Recruitment and selection, Psychological tests.	
UNIT IV	6
Performance management and training: Performance appraisal, Importance and Methods of Performance appraisal, Training and development- Concepts and Benefits to the organisation	

Books & References:

1. Industrial/Organizational Psychology- Miner, J. B., N Y: McGraw Hill, 1992
2. Industrial Psychology: Its Theoretical & Social Foundations - Blum & Naylor, CBS Publications, 1962
3. Industrial/Organization Psychology: A Applied Approach - Aamodt, M. G., 5th edition, Wadsworth/Thompson: Belmont, C. A., 2007
4. Human Resource Management - Aswathappa K. , 5th edition, Tata McGraw Hill, 2008
5. Industrial Psychology - Archana Deshpande, Sun India Publications, New Delhi, 2010

BAS-13 INDUSTRIAL SOCIOLOGY 3 Credits (2-1-0)

UNIT I	6
Introduction to Industrial Sociology: Nature, Scope and importance of Industrial Sociology, Development of Industrial Sociology and other social sciences. Understanding social structure and social processes: Perspectives of Marx, Weber & Durkheim.	
UNIT II	6
Rise and development of industry: Early industrialisation- Types of productive systems- Evolution of Productive system and Development of Industry, Primitive Stage, Agrarian economy Stage, Handicrafts Stage, Guild System, Feudal or Manorial System, Putting out System, Industrial Revolution, Industrialisation- Causes and Consequences.	
UNIT III	6
Contemporary issues in Industrial Sociology Industrial Policy Resolutions: Social change in contemporary India: Modernization and globalization, Secularism and communalism, Nature of development, Processes of social exclusion and inclusion, Changing nature of work and organization ,Industrial Grievances, Industrial conflicts, Industrial disputes in India, Strike and Lock-out, Promote industrial Peace. Industrial Policy Resolutions	
UNIT IV	6
Industrial relations machinery in India: Tripartite and Bipartite Machinery, Code of discipline and standing orders and Trade unionism, The National Commission on Labour, Industrial Relations and Technology, Sociological Approach to Industrial relations	

Books & References:

1. Dorling. Kindersley (India) P. Ltd - Durae, Pravin., Pearson Education in South Asia, 2013.
2. Industrial Sociology- Archana Deshpande, Sun India Publications, New Delhi, 2010
3. Industry and Labour - Ramaswamy, E.A. and Ramaswamy,U., OU Press, 1981

4. Themes and Perspectives in Indian Sociology - Dhanagare, D.N., Rawat
5. Contemporary India: Economy, Society and Politics - Chandoke, Neera & Praveen Priyadarshi, Pearson, 2009

BAS-14

GRAPH THEORY

5 Credits (3-1-2)

Course Objectives:

Knowledge of basic graph theory and development of skills in problem solving, mathematical writing, and mathematical discussion

Learning Outcomes:

Upon successful completion of this course, students will be able to

1. Demonstrate knowledge of the syllabus material;
2. Write precise and accurate mathematical definitions of objects in graph theory;
3. Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples;
4. Validate and critically assess a mathematical proof;
5. Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of questions in graph theory;
6. Reason from definitions to construct mathematical proofs;
7. Write about graph theory in a coherent and technically accurate manner.

UNIT I

9

Preliminaries: Sets, relations, functions & multi-sets, Inductive definition and proof by induction, Cardinality of sets

Basic concepts of Graph Theory: Digraphs, graphs and other similar objects, Representations of digraphs and graphs, Operations on graphs, degree sequence and isomorphism

Connectedness and distance: Walks, trails, circuits, cycles, and paths, Connected digraphs and graphs, Weighted graphs and digraphs and distance

UNIT II

9

Trees and their applications: Basic properties of trees and forests, Minimum-weight spanning trees, Enumeration of labeled trees, Rooted trees and uniquely decipherable coding, Tree traversals and parentheses-free notations

Networks and flows: Legal flows and capacities of cuts, The Ford-Fulkerson Algorithms and Maxflow-Mincut theorem

UNIT III

9

Edge and Vertex traversal problems: Euler circuits and Euler trails, Fleury's algorithm and the Chinese Postman problem, Hamilton cycles and the Travelling Salesman problem

Planar embeddings of graphs: Basic properties of planar graphs, Kuratowski's theorem and non-planar graphs, The DMP planarity algorithm, Polyhedral graphs and geometric dual

UNIT IV

9

Colorings and Matchings in graphs: Legal colorings and k-colorable graphs, Chromatic Polynomial and Four-color theorem, Matchings in graphs and Stable marriage algorithm

Directed graphs: Tournaments, directed paths and cycles, connectivity and strongly connected digraphs, branching, Infinite graphs and digraphs

COMPUTER PROGRAMMING LAB

1. Write a recursive program that computes the value of $\ln(N!)$.
2. Write a C program to Implement Euler Circuit which starts and ends on the same vertex.
3. Write a C Program to Implement Hamiltonian Cycle Algorithm.
4. Write a C Program to assign a colour to each of the states so that no two adjacent states share the same colour. The program should output each state and its colour. **Example:** Alabama touches Florida, Mississippi, Tennessee, and Georgia. Arkansas touches Louisiana, Texas, etc.
5. Graph implementation of BFS and DFS using C.

6. Write a C Program to Implement Euler Circuit problem. In graph theory, this starts and ends on the same vertex.
7. Write a C Program for the 'marriage problem', for N boys and N girls and an NxN binary matrix telling us which pairings are suitable, and want to pair each girl to a boy. Implement perfect matching in a bipartite graph.
8. Write a C program to implement ford-fulkerson algorithm
9. Write A C program for the implementation of the Branch and Bound Algorithm: The Asymmetric Travelling Salesman Problem.
10. Write a C program for Dijkstra's Algorithm for Finding Shortest Paths in Non-Negative Weight Graphs.
11. Write a C program to check whether the given graph is tree.
12. Write a C program to extract spanning tree (without using Kruskal and prim's Algorithm).
13. Write a C program to perform following operations on a given 2 connected graph
 - i. Union
 - ii. intersection
 - iii. deletion of a vertex
 - iv. deletion of any edge
 - v. fusion of 2 vertex
14. Write a C program to input an image (Graph) and find out its adjacency and incidence matrix.
15. Write a C program to extract walk, path from any vertex to any vertex in a given graph.
16. Write a C program for the
 - i. test for emptyness
 - ii. return the number of vertices
 - iii. return the number of edges
 - iv. test if a given vertex exists
 - v. test if a given edge exists
 - vi. add a vertex (this operation does not add any edge)
 - vii. add an edge (this operation may result in adding new vertices)
 - viii. delete a vertex (this operation may result in deleting edges)
 - ix. delete an edge (this operation may result in deleting vertices)

Books & References:

1. Muhammad Aurangzeb Ahmad's Encyclopedia of Graph Theory - Ahmad, M. A., <http://www.cs.rit.edu/~maa2454/Graphs/>.
2. Graph Connections: Relationships Between Graph Theory and Other Areas of Mathematics - Beinecke, L. W. and Wilson, R. J. (Eds.), Oxford, England: Oxford University Press, 1997.
3. Graphs and Hypergraphs -Berge, C., New York: Elsevier, 1973.
4. Theory of Graphs and Its Applications - Berge, C., New York: Wiley, 1962.
5. Graph Theory: An Introductory Course - Bollobás, B., New York: Springer-Verlag, 1979.
6. Modern Graph Theory- Bollobás, B., New York: Springer-Verlag, 1998.

CIVIL ENGINEERING DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

SUBJECTS OFFERED BY THE DEPARTMENT

Engineering Fundamentals & Department Core (Civil Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
Year-I							
1.	BCE-01	Mechanics of Structures	-	3	1	2	5
2.	BCE-10	Engineering Graphics	-	0	0	4	2
Year-II							
3.	BCE-11	Concrete and Concrete Structures	-	3	1	0	4
4.	BCE-12	Basic Surveying	-	3	1	2	5
5.	BCE-13	Engineering Geology & Building Material	-	0	0	4	2
6.	BCE-14	Structural Mechanics-I	-	3	1	2	5
7.	BCE-15	Fluid Mechanics	-	3	1	2	5
8.	BCE-16	Hydraulic and Hydraulic Machines	Fluid Mechanics	3	1	2	5
9.	BCE-17	Structural Mechanics -II	Structural Mechanics-I	3	1	0	4
10.	BCE-18	Advanced Surveying	Basic Surveying	3	1	2	5
11.	BCE-19	Building Construction and Planning Estimation and Costing	Engineering Graphics	3	1	2	5
Year-III							
12.	BCE-26	Environmental Engineering-I	-	3	1	2	5
13.	BCE-27	Geotechnical Engineering-I	-	3	1	2	5
14.	BCE-28	Transportation Engineering-I	-	3	1	2	5
15.	BCE-29	Design of Concrete Structures	Concrete & Concrete Structures	3	1	2	5
16.	BCE-30	Seminar	-	0	0	6	3
17.	BCE-31	Geotechnical Engineering-II	Geotechnical Engineering-I	3	1	2	5
18.	BCE-32	Environmental Engineering-II	Environmental Engineering-I	3	1	0	4
19.	BCE-33	Steel Structures	Structural Mechanics -I & II	3	1	0	4
20.	BCE-34	Transportation Engineering-II	Transportation Engineering-I	3	1	0	4
21.	BCE-35	Construction Technology and Management	-	3	1	0	4
22.	BCE-36	Survey Camp*	Basic Surveying	0	0	9	3
Year-IV							
23.	BCE-40	Project Part-I	-	0	0	10	5
24.	BCE-41	Water Resources Engineering	Fluid Mechanics	3	1	2	5
25.	BCE-42	Earthquake Resistant Design	Structural Mechanics – I & II	3	1	2	5
26.	BCE-43	Analysis and Design of Hydraulic Structures	Water Resources Engineering	3	1	0	4
27.	BCE-45	Industrial/Practical Training	-	0	0	2	1
28.	BCE-50	Project Part-II	Project Part-I	0	0	10	5

Programme Electives (PE1)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BCE-51	Solid Waste Management	-	3	1	0	4
2.	BCE-52	Environmental Impact Assessment	Environmental Engineering – I & II	3	1	0	4
3.	BCE-53	Rock Mechanics	Engineering Geology & Building Materials	3	1	0	4

4.	BCE-54	Bridge Engineering	Structural Engineering I & II & Concrete structures	3	1	0	4
5.	BCE-55	Disaster Management	-	3	1	0	4
6.	BCE-56	Advanced Engineering Hydrology	Water Resources Engineering	3	1	0	4

Programme Electives (PE2)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1	BCE-57	Geo-environmental Engineering	Geotechnical Engineering I & II, Environmental Engineering-I & II	3	1	0	4
2	BCE-58	Advanced Structural Engineering	Structural Mechanics – I & II	3	1	0	4
3	BCE-59	Principles of Remote Sensing	Basic Surveying	3	1	0	4
4	BCE-60	Advanced Hydraulic Structures	Analysis & Design of Hydraulic Structures	3	1	0	4
5	BCE-61	Matrix Method of Analysis	Structural Mechanics-I & II	3	1	0	4
6	BCE-62	Open Channel Flow	Fluid Mechanics & Hydraulic & Hydraulic Machines	3	1	0	4

Programme Electives (PE3)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credit
1.	BCE-63	Advanced Foundation Engineering	Geotechnical Engineering-I & II	3	1	0	4
2.	BCE-64	River Engineering	Open Channel Flow	3	1	0	4
3.	BCE-65	Advance Concrete Design	Design of Concrete Structures	3	1	0	4
4.	BCE-66	Water Resources Systems	Water Resources Engineering	3	1	0	4
5.	BCE-67	Principles of Geographic Information System	Remote Sensing	3	1	0	4
6.	BCE-68	Earth and Earth Retaining Structures	Geotechnical Engineering-I & II	3	1	0	4
7.	BCE-69	Air and Noise Pollution control	Environmental Engineering-I & II	3	1	0	4

Programme Electives (PE4)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BCE-70	Ground Improvement Techniques	Geotechnical Engineering-I & II	3	1	0	4
2.	BCE-71	Transportation System & Planning	Transportation Engineering-I & II	3	1	0	4
3.	BCE-72	Industrial Pollution control and Environmental Audit	Environmental Engineering-I & II	3	1	0	4
4.	BCE-73	Structural Dynamics	Structural Engineering-I & II	3	1	0	4
5.	BCE-74	Airport, Docks & Harbour Engineering	Transportation Engineering-I & II	3	1	0	4
6.	BCE-75	Environmental Quality Management	Environmental Engineering-I & II	3	1	0	4

Subjects offered for other Departments

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BCE 02	Fire Hazards and Safety	-	2	1	0	3
2.	BCE-21	Environmental Impact Assessment & Management	-	3	1	0	4

SYLLABI

BCE-01

MECHANICS OF STRUCTURES

5 Credits (3-1-2)

UNIT I

9

Statics –Basics Concepts, Fundamental principles & concepts: Vector algebra, Newton’s laws, gravitation, force (external and internal, transmissibility), couple, moment (about point and about axis), Varignon’s theorem, resultant of concurrent and non-concurrent coplanar forces, static equilibrium, free body diagram, reactions. Problem formulation concept; 2-D statics, two and three force members, alternate equilibrium equations, constraints and static determinacy; 3-D statics

Analysis of Structures- Trusses: Assumptions, rigid and non-rigid trusses; Simple truss (plane and space), analysis by method of joints. Analysis of simple truss by method of sections; Compound truss (statically determinate, rigid, and completely constrained). Analysis of frames and machines

UNIT II

9

Friction- Coulomb dry friction laws, simple surface contact problems, friction angles, types of problems, wedges. Sliding friction and rolling resistance.

Moment of Inertia- First moment of mass and center of mass, centroids of lines, areas, volumes, composite bodies. Area moments- and products- of inertia, radius of gyration, transfer of axes, composite areas. Rotation of axes, principal area-moments-of-inertia, Mohr’s circle, Second moment of mass, Mass moments- and products- of inertia, radius of gyration, transfer of axes, flat plates (relation between area- and mass- moments- and products- of inertia), composite bodies, Rotation of axes, principal mass-moments-of-inertia

UNIT III

9

Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom, Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium, Applications of energy method for equilibrium, Stability of equilibrium

Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates), 3-D curvilinear motion; Relative and constrained motion; Newton’s 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy, Impulse-momentum (linear, angular); Impact (Direct and oblique)

UNIT IV

9

Plane kinematics of rigid bodies- Rotation; Parametric motion, Relative velocity, instantaneous center of rotation, Relative acceleration, rotating reference frames. Rotating reference frames, 3-part velocity and 5-part acceleration relations, Coriolis acceleration. Applications of rotating reference frames.

Plane kinetics of rigid bodies- Kinetics of system of particles and derivation of moment equation, Translation Fixed axis rotation; General planar motion, Work – kinetic energy, potential energy, power; Impulse-momentum, Impact; Combination problems

EXPERIMENTS

Note: Any 10 experiments of the following or similar experiments suitably designed

1. To verify the law of parallelogram of forces.
2. To study the equilibrium of a body under three forces.
3. To determine the coefficient of friction of a flat surface.
4. Friction experiment on screw-jack.
5. Experiment based on analysis of truss.
6. To determine the mass moment of inertia of a rotating disc.
7. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
8. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the impact Strength of the specimen.
9. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
10. Simple & compound gear-train experiment.
11. Worm & worm-wheel experiment for load lifting.
12. Belt-Pulley experiment.

13. Bending of simply-supported and cantilever beams for theoretical & experimental deflection.
14. Dynamics experiment on momentum conservation
15. Dynamics experiment on collision for determining coefficient of restitution.
16. Experiment on Torsion of Rod/wire

Books & References:

1. Vector Mechanics for Engineers: Statics and Dynamics - Johnston, R.E., Beer, F., Eisenberg, E. R., & Mazurek, D., McGraw Hill
2. Engineering Mechanics: Statics & Engineering Mechanics: Dynamics - Meriam, J. L., & Kraige, L. G., John Wiley & Sons
3. Engineering Mechanics: Statics and Dynamics - Hibbeler, R. C., Prentice Hall
4. Engineering Mechanics - Statics and Dynamics - Irving, H., Shames, Prentice Hall of India
5. Engineering Mechanics: Statics & Engineering Mechanics: Dynamics - Pytel, A., Kiusalaas, J., & Sharma, I., Cengage Learning
6. Engineering Mechanics – Statics & Dynamics, Palanichamy, M.S., Nagan, S., TMH
7. Fundamentals of Engineering Mechanics - Rajasekaran, S, Sankarasubramanian, G., , Vikas Publishing
8. Engineering Mechanics - McLean, Schaum Series, McGraw Hill
9. NPTEL courses: <http://nptel.iitm.ac.in/courses.php>, web and video resources on Engineering

BCE-10

ENGINEERING GRAPHICS

2 Credits (0-0-4)

The objective of this Course is to provide the basic knowledge about Engineering Drawing. Detailed concepts are given in projections, technical drawing, dimensioning and specifications, so useful for a student in preparing for an engineering career

UNIT I: Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

Orthographic Projections covering, Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

UNIT II: Projections of Regular Solids covering, those inclined to both the Planes- Auxiliary Views;

Unit-III: Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone;

Unit-IV: Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions

Books & References:

1. Engineering Drawing - Bhat, N.D.& M. Panchal, Charotar Publishing House, 2008
2. Engineering Drawing and Computer Graphics - Shah, M.B. & B.C. Rana, Pearson Education, 2008
3. A Text Book of Engineering Drawing - Dhawan, R.K., S. Chand Publications, 2007
4. Text book on Engineering Drawing - Narayana, K.L. & P Kannaiah, Scitech Publishers, 2008

COMPUTER SCIENCE & ENGINEERING DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

SUBJECTS OFFERED BY THE DEPARTMENT

Engineering Fundamentals & Department Core (Computer Science & Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
I Year							
1.	BCS-02	Introduction to C & Functional Programming	-	3	1	2	5
2.	BCS-03	Software Lab-I	-	0	0	4	2
3.	BCS-04	Object Oriented Modeling & C++	-	3	1	2	5
4.	BCS-05	Software Lab-II	-	0	0	4	2
II Year							
5.	BCS-11	Digital Circuits and Logic Design	-	3	1	0	4
6.	BCS-12	Principles of Data Structures through C/C++	-	3	1	2	5
7.	BCS-13	Internet & Java Programming	-	3	1	2	5
8.	BCS-14	Software Lab-III	-	0	0	4	2
9.	BCS-15	Database Management Systems	-	3	1	2	5
10.	BCS-16	Theory of Computation	-	3	1	0	4
11.	BCS-17	Computer Organization & Design	-	3	1	2	5
12.	BCS-18	Software Lab-IV	-	0	0	4	2
III Year							
13.	BCS-26	Principles of Operating Systems	-	3	1	2	5
14.	BCS-27	Computer Graphics	-	3	1	2	5
15.	BCS-28	Design & Analysis of Algorithms	-	3	1	2	5
16.	BCS-29	Advanced Computer Architecture	-	3	1	2	5
17.	BCS-31	Principle of Compiler Design	-	3	1	2	5
18.	BCS-32	Artificial Intelligence	-	3	1	2	5
19.	BCS-33	Web Technologies	-	3	1	2	5
20.	BCS-34	Computer Networks	-	3	1	2	5
21.	BCS-35	Software Engineering	-	3	1	2	5
22.	BCS-30	Seminar	-	0	0	6	-
IV Year							
23.	BCS-41	Introduction to Machine Learning	-	3	1	2	5
24.	BCS-42	Parallel & Distributed Computing	-	3	1	2	5
25.	BCS-40	Project Part-I	-	0	0	10	5
26.	BCS-45	Industrial/Practical Training	-	0	0	2	-
27.	BCS-43	Mobile Computing	-	3	1	2	5
28.	BCS-50	Project Part-II	Project Part-I	0	0	10	5

Programme Electives (Computer Science & Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
PE1 & PE2 (VII Semester)							
1.	BCS-51	Advanced Java	Java Programming	3	1	0	4
2.	BCS-52	.Net Technology	-	3	1	0	4
3.	BCS-53	LAMP Technology	-	3	1	0	4
4.	BCS-54	Network Programming	Computer Networks	3	1	0	4
5.	BCS-55	Mobile Application Programming	Computer Networks	3	1	0	4
6.	BCS-56	Linux Administration & System Call Programming	Operating systems	3	1	0	4
7.	BCS-57	Database Administration with ORACLE	DBMS	3	1	0	4
8.	BCS-58	Data warehousing & Data Mining	DBMS	3	1	0	4
9.	BCS-59	Analytics and Systems of Big Data	DBMS	3	1	0	4
10.	BCS-60	Game Theory	-	3	1	0	4
PE-3 & PE-4 (VIII Semester)							
11.	BCS-62	Advanced Programming Techniques	-	3	1	0	4
12.	BCS-63	Computer Vision: Foundations and Applications	-	3	1	0	4
13.	BCS-64	Software Reuse	S/W Engg	3	1	0	4
14.	BCS-65	Software Verification & Validation	S/W Engg	3	1	0	4
15.	BCS-66	Software Design & Construction	S/W Engg	3	1	0	4
16.	BCS-67	Software Quality Management	S/W Engg	3	1	0	4
17.	BCS-68	Aspect Oriented Programming	-	3	1	0	4
18.	BCS-69	Neural Networks & Fuzzy Systems	-	3	1	0	4
19.	BCS-70	Fundamentals of Cloud Computing	Operating Systems, Computer Networks	3	1	0	4
20.	BCS-71	Advanced Multi-core Systems	Design & Analysis of Algorithms	3	1	0	4
21.	BCS-72	Cryptography & Information Security	-	3	1	0	4
22.	BCS-73	Digital Image Processing	Digital Signal Processing	3	1	0	4
23.	BCS-74	High Performance Computing	-	3	1	0	4
24.	BCS-75	Introduction to Real Time Systems	-	3	1	0	4

Subjects for other Departments

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BCS-01	Introduction to Computer Programming	-	3	1	2	5
2.	BCS-51	Database Management System, Data Mining & Warehousing	-	3	1	0	4
3.	BCS-52	Web Designing	-	0	0	4	2

SYLLABI**BCS-01 INTRODUCTION TO COMPUTER PROGRAMMING 5 Credits (3-1-2)**

Course Objectives: Students are expected to be able to understand, implement and debug practical computer programs using C language. In particular, they should be able to:

1. Read and understand C programs.
2. Discuss basic theory and practice of programming.
3. Design and implement practical programs using C language.
4. Use compiler and feel comfortable with Windows environment.

5. Identify and fix common C errors.

Learning Outcomes:

1. Given a problem definition/specification the student will design, code, debug and provide the instructor with an executable program that fulfills the specification.
2. Develop a C program that contains functions and parameters
3. Students will be able to read, understand and trace the execution of programs written in C language.
4. For a given algorithm students will be able to write the C code using a modular approach.

UNIT I

9

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: DOS, Windows, Linux, function, services and types.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

UNIT II

9

Standard I/O in “C”, Fundamental Data Types and Storage Classes: Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity,

C Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break, Program Loops and Iteration: Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue,

UNIT III

9

Arrays: one dimensional, multidimensional array and their applications, Declaration and manipulation of arrays

Structures: Purpose and usage of structures, declaring structures, assigning of structures,

Strings: String variable, String handling functions, Array of strings

Functions: Designing structured programs, Functions in C, User defined and standard functions, Formal vs. actual arguments, Function category, Function prototype, Parameter passing, Recursive functions.

Storage classes: Auto, Extern, register and static variables

UNIT IV

9

Pointers: Pointer variable and its importance, pointer arithmetic and scale factor, Compatibility, Dereferencing, L-value and R-value, Pointers and arrays, Pointer and character strings, Pointers and functions, Array of pointers, pointers to pointers

Dynamic memory allocation

Structure and union: declaration and initialization of structures, Structure as function parameters, Structure pointers, Unions.

File Management: Defining and opening a file, Closing a file, Input/output Operations in files, The Pre-processor directives, command line arguments.

COMPUTER PROGRAMMING LAB

1. Write a program that finds whether a given number is even or odd.
2. Write a program that tells whether a given year is a leap year or not.
3. Write a program that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
 - a. Between 90-100%-----Print ‘A’
 - b. 80-90%-----Print ‘B’
 - c. 60-80%-----Print ‘C’
 - d. Below 60%-----Print ‘D’
4. Write a program that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
5. Write a program to print sum of even and odd numbers from 1 to N numbers.
6. Write a program to print the Fibonacci series.
7. Write a program to check whether the entered number is prime or not.
8. Write a program to find the reverse of a number.

9. Write a program to print Armstrong Numbers from 1 to 100.
10. Write a program to convert binary number into decimal number and vice versa.
11. Write a program that simply takes elements of the array from the user and finds the sum of these elements.
12. Write a program that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
13. Write a program to find the minimum and maximum element of the array.
14. Write a program to search an element in array using Linear Search.
15. Write a program to sort the elements of the array in ascending order using Bubble Sort technique.
16. Write a program to add and multiply two matrices of order NxN.
17. Write a program that finds the sum of diagonal elements of a MxN matrix.
18. Define a structure data type TRAIN_INFO. The type contain
 - a. Train No.: integer type
 - b. Train name: string
 - c. Departure Time: aggregate type TIME
 - d. Arrival Time : aggregate type TIME
 - e. Start station: string
 - f. End station : string

The structure type Time contains two integer members: hour and minute. Maintain a train Time table and implement the following operations:

 - i. List all the trains (sorted according to train number) that depart from a particular section.
 - ii. List all the trains that depart from a particular station at a particular time.
 - iii. List all the trains that depart from a particular station within the next one hour of a given time.
 - iv. List all the trains between a pair of start station and end station.
19. Write a program to swap two elements using the concept of pointers.
20. Write a program to compare the contents of two files and determine whether they are same or not.
21. Write a program to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

Books & References:

1. Problem Solving and Program Design in C - Jeri R. Hanly, Elliot B. Koffman, 7th edition, Pearson
2. Complete reference with C Tata McGraw Hill
3. The C programming language - Kerninghan and Ritchie, Prentice Hall

BCS-02 INTRODUCTION TO C & FUNCTIONAL PROGRAMMING 5 Credits (3-1-2)

Course Objectives: Students are expected to be able to understand, implement and debug practical computer programs using C language at the end of the semester. In particular, they should be able to:

1. Read and understand C programs.
2. Discuss basic theory and practice of programming.
3. Design and implement practical programs using C language.
4. Use compiler and feel comfortable with Windows environment.
5. Identify and fix common C errors.
6. Understands the basics of functional programming

Learning Outcomes: A student who successfully completes the course will have the ability to:

1. understand the basic terminology used in computer programming
2. write, compile and debug programs in C language.
3. use different data types in a computer program.
4. design programs involving decision structures, loops and functions.
5. explain the difference between call by value and call by reference
6. understand the dynamics of memory by the use of pointers.
7. Understand and use string in the programs
8. use different data structures and create/update basic data files.

UNIT I

9

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Data types, Operators, expressions, operator precedence and associativity

Fundamentals of C programming: Structure of C program, writing and executing the first C program, components of C language. Standard I/O in C

Conditional program execution: Applying if and switch statements, nesting if and else, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

UNIT II

9

Arrays: one dimensional, multidimensional array and their applications, Declaration and manipulation of arrays

Strings: String variable, String handling functions, Array of strings

Functions: Designing structured programs, Functions in C, User defined and standard functions, Formal vs. actual arguments, Function category, Function prototype, Parameter passing, Recursive functions.

Storage classes: Auto, Extern, register and static variables

UNIT III

9

Pointers: Pointer variable and its importance, pointer arithmetic Pointers and arrays, Pointer and character strings, Pointers and functions, Array of pointers, pointers to pointers, Dynamic memory allocation

Structure and union: declaration and initialization of structures, Structure as function parameters, Structure pointers, Unions.

File Management: Defining and opening a file, Closing a file, Input/output Operations in files, Random Access to files, Error handling

The Pre-processor directives, command line arguments, Macros

UNIT IV

9

Principles of functional programming: expressions, evaluations, functions, and types. Type definitions and built-in types: numbers, characters, strings and lists. Basic operations on lists, including map, fold and filter, together with their algebraic properties. Recursive definitions and structural induction, Simple program calculation, Infinite lists and their uses

COMPUTER PROGRAMMING LAB

1. Write a program to find the nature of the roots as well as value of the roots. However, in case of imaginary roots, find the real part and imaginary part separately.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a program to generate the first n terms of the sequence. For example, for n = 8, the output should be 0 1 1 2 3 5 8 13
3. Write a program to print all the prime numbers between m and n, where the value of m and n is supplied by the user.
4. The number such as 1991 is a palindrome because it is same number when read forward or backward. Write a program to check whether the given number is palindrome or not.
5. A positive integer number IJK is said to be well-ordered if $I < J < K$. For example, number 138 is called well-ordered because the digits in the number (1, 3, 8) increase from left to right, i.e., $1 < 3 < 8$. Number 365 is not well-ordered because 6 is larger than 5. Write a program that will find and display all possible three digit well-ordered numbers. The program should also display the total number of three digit well-ordered numbers found.
6. Write a function to compute the highest common factor of integer numbers m and n. Use this function to find the highest common factor of integer numbers a and b.
7. Write a program to multiply matrix A ($m \times n$) by B ($p \times q$), given that $n = p$.
8. Write a program to sort a list of n integer numbers in descending order using bubble sort method.

Books & References:

1. Problem Solving and Program Design in C - Jeri R. Hanly, Elliot B. Koffman, 7th edition, Pearson
2. Complete reference with C Tata McGraw Hill
3. The C programming language - Kerninghan and Ritchie, Prentice Hall
4. Introduction to Functional Programming using Haskell- Richard Bird, 2nd edition, Prentice-Hall International, 1998

EXPERIMENTS

The students should write programs in C to get the familiarization with following topics.

1. Get familiar with C compiler
2. Implement and Test Small Routine in C
3. Evaluation of Expression
4. Iteration, Function and recursive function
5. Arrays,
6. Structures Union
7. Searching, Selection
8. Sorting,
9. Strings Handling
10. Basic pointer programming
11. Files
12. Use of Std. C Library
13. Basics of functional programming.

Course Objectives:

1. Understand object oriented programming and advanced C++ concepts.
2. Be able to program using more advanced C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, etc.
3. Be able to build C++ classes using appropriate encapsulation and design principles.
4. Be able to apply object oriented techniques to solve bigger computing problems.

Learning Outcomes:

1. To understand the concept of Object Oriented Programming and master OOP using C++.
2. Implementing the real life problems using Object Oriented Techniques.
3. Ultimate goal: to make a good programmer.
4. Improve problem solving skills.

UNIT I**9**

Object Oriented Programming Concepts – objects-classes- methods and messages-abstraction and encapsulation-inheritance- abstract classes- polymorphism. Introduction to C++- objects-classes- constructors and destructors.

UNIT II**9**

Operator overloading - friend functions- type conversions- templates - Inheritance – virtual functions- runtime polymorphism. Exception handling - Streams and formatted I/O

UNIT III**9**

Object Modeling: Objects and classes, links and associations, generalization and inheritance, Aggregation, abstracts class, multiple inheritance, Meta data, candidate keys, constraints. Dynamics Modeling: Events and states, operations, nested state diagrams and concurrency.

UNIT IV**9**

Functional Modeling: Data flow diagram, specifying operations, constraints, a sample functional model. OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD, JSD.

COMPUTER PROGRAMMING LAB

Write C++ Programs to illustrate the concept of the following:

1. Arrays
2. Structures
3. Pointers

4. Objects and Classes
5. Console I/O operations
6. Scope Resolution and Memory Management Operators
7. Inheritance
8. Polymorphism
9. Virtual Functions
10. Friend Functions
11. Operator Overloading
12. Function Overloading
13. Constructors and Destructors
14. this Pointer
15. File I/O Operations

Analyze, design and develop code for the following system (one for a batch of three students) using object oriented methodology:

1. ATM (Automated Teller Machine) System
2. Online Reservation System
3. Online Quiz System
4. Stock Maintenance System
5. Course Registration System
6. Payroll System
7. Expert System
8. Library Management System
9. Real Time Scheduler
10. Online Purchase System

Books & References:

1. Programming with ANSI C++ - B. Trivedi, Oxford University Press, 2007.
2. Object Oriented Programming using C++ - Ira Pohl, Pearson Education, Second Edition
3. The C++ Programming Language - B. Stroustrup, 3rd edition, Pearson Education, 2004
4. Object Oriented Modeling and Design- James Rumbaugh et. al, PHI
5. Object Oriented Programming in Turbo C++ - Robert Lafore, Galgotia Publication, 1994
6. Object Oriented Programming with C++ - E. Balagurusamy, TMH Publication
7. The Unified Modeling Language User Guide - Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education
8. Object Oriented Analysis and Design with Applications-Booch, Maksimchuk, Engle, Young, Conallen and Houston, Pearson Education
9. C++ Primer - S. B. Lippman, Josee Lajoie, Barbara E. Moo, 4th edition, Pearson Education, 2005

BCS-05

SOFTWARE LAB-II

2 Credits (0-0-4)

EXPERIMENTS

To write following programs in C++:

1. Using basic statements like control statements, looping statements, various I/O statements and various data structures.
2. Creating classes in C++ for understanding of basic OOPS features.
3. Representing concepts of data hiding, function overloading and operator overloading.
4. Using memory management features and various constructors and destructors.
5. Representing Inheritance, virtual classes and polymorphism.
6. Writing generic functions.
7. File handling programs.
8. Design and Implementation of some real life problems using Object Oriented techniques (Object Model/Dynamic Model/Functional Model).

ELECTRICAL ENGINEERING DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

SUBJECTS OFFERED BY THE DEPARTMENT

Engineering Fundamentals & Department Core (Electrical Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
I Year							
1.	BEE-02	Electrical Circuits and Analysis	-	3	1	2	5
II Year							
2.	BEE-11	Basic System Analysis	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	0	4
3.	BEE-12	Electrical Measurement & Measuring Instruments	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	2	5
4.	BEE-13	Electromechanical Energy Conversion-I	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	2	5
5.	BEE-14	Network Analysis and Synthesis	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	2	5
6.	BEE-15	Introduction to Microprocessors	-	3	1	2	5
7.	BEE-20	Simulation Techniques	-	0	0	4	2
III Year							
8.	BEE-26	Electromechanical Energy Conversion-II	Electromechanical Energy Conversion-I	3	1	2	5
9.	BEE-27	Power System- I	-	3	1	0	4
10.	BEE-28	Control System Engineering	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	2	5
11.	BEE-29	Instrumentation & Process Control	Control System Engineering	3	1	2	5
12.	BEE-31	Power System- II	Power System- I	3	1	2	5
13.	BEE-32	Power Electronics	Digital Electronics and Circuits	3	1	2	5
14.	BEE-33	Power Plant Engineering	Power System-I	3	1	0	4
15.	BEE-30	Seminar		0	0	6	3
IV Year							
16.	BEE-41	Electric Drives	Power Electronics	3	1	2	5
17.	BEE-42	Switch Gear & Protection	Power System-I & II	3	1	2	5
18.	BEE-43	Power System Operation and Control	Power System-I & II	3	1	0	4
19.	BEE-44	Utilization & Traction	Electromechanical Energy Conversion-I& II	3	1	0	4
20.	BEE-46	Power Quality	Power System-I & II Power Electronics	3	1	0	4
21.	BEE-40	Project Part-I	-	0	0	10	5
22.	BEE-45	Industrial/Practical Training	-	0	0	2	1
23.	BEE-50	Project Part-II	Project Part-I	0	0	10	5

Programme Electives (Electrical Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
PE1 (V Semester)							
1.	BCS-36	Database Management System, Data Mining and Warehousing	-	3	1	0	4
2.	BCS-43	Network Security & Cryptography	-	3	1	2	5
3.	BEC-42	Digital Signal Processing	-	3	1	2	5
4.	BEC-14	Electromagnetic Field Theory	-	3	1	0	4
PE2 (VI Semester)							
5.	BEE-51	High Voltage Engineering	Power System-I & II	3	1	0	4
6.	BEE-52	Intelligent Instrumentation	Electrical Measurement & Measuring Instruments	3	1	0	4
7.	BEE-53	Digital Control System	Control System Engineering	3	1	0	4
8.	BEE-54	Conventional and CAD of Electrical Machines	Electromechanical Energy Conversion-I&II	3	1	2	5
PE3 (VII Semester)							
9.	BCS-13	Object Oriented Techniques and JAVA Programming	-	3	1	0	4
10.	BEC-28	Principle of Communication	-	3	1	2	5
11.	BEE-55	EHV AC & DC Transmission	Power System-I & II	3	1	0	4
12.	BEE-56	Advanced Microprocessors and Micro Controllers	Introduction to Microprocessors	3	1	2	5
PE4 (VIII Semester)							
13.	BEE-57	Modern Control System	Digital Control System	3	1	0	4
14.	BEE-58	SCADA & Energy Management System	Power System-I&II	3	1	0	4
15.	BEE-59	Energy Efficiency & Conservation	Power System-I&II	3	1	0	4
16.	BEE-60	Bio Instrumentation	-	3	1	0	4

Subjects offered for other departments

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BEE-01	Principles of Electrical Engineering	-	3	1	2	5
2.	BEE-16	Electromechanical Energy Conversion	Electrical Circuits and Analysis/ Principles of Electrical Engineering	3	1	2	5

SYLLABI

BEE-01	PRINCIPLES OF ELECTRICAL ENGINEERING	5 Credits (3-1-2)
---------------	---	--------------------------

UNIT I**9**

D C Circuit Analysis and Network Theorems: Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation Kirchhoff's laws; Loop and nodal methods of analysis; Star-delta transformation Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem.

UNIT II**9**

Steady- State Analysis of Single Phase AC Circuits: AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of

sinusoidally varying voltage and current, Analysis of series, parallel and series-parallel RLC Circuits, Resonance in series and Parallel circuit

Three Phase AC Circuits: Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement

UNIT III

9

Measuring Instruments, Magnetic Circuit & 1 phase Transformers: Types of instruments, Construction and working principles of PMMC and Moving Iron type voltmeters & ammeters, Use of shunts and multipliers
Magnetic circuit, concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses

Single Phase Transformer: Principle of operation, Construction, EMF equation, Power losses, Efficiency, Introduction to auto transformer.

UNIT IV

9

Electrical Machines: Concept of electromechanical energy conversion DC machines: Types, EMF equation of generators and torque equation of motor, Characteristics and applications of DC Generators & motors

Three Phase Induction Motor: Types, Principle of operation, Torque-slip characteristics, applications

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator, e.m.f. equation, Principle of operation and starting of synchronous motor, their applications.

EXPERIMENTS

1. Verification of Kirchhoff's law
2. Verification of Norton's theorem
3. Verification of Thevenin's theorem
4. Verification of Series R-L-C circuit
5. Verification of Parallel R-L-C circuit
6. Measurement of Power and Power factor of three phase inductive load by two wattmeter method
7. To draw the magnetization characteristics of separately excited dc motor.
8. To perform the external load characteristics of dc shunt motor.
9. To perform O.C. and S.C. test of a single phase transformer

Books & References:

1. Principles of Electrical Engineering-V. Del Toro (Prentice Hall International)
2. Basic Electrical Engineering-D. P. Kothari & I.J. Nagarath (Tata McGraw Hill)
3. Basic Electrical Engineering-S. N. Singh (Prentice Hall International)
4. Fundamentals of Electrical Engineering-B. Dwivedi & A. Tripathi (Wiley India)
5. Electrical and Electronics Technology-Edward Hughes (Pearson)

BEE-02 ELECTRICAL CIRCUIT ANALYSIS

5 Credits (3-1-2)

UNIT I

9

D C Circuit Analysis and Network Theorems: Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation Kirchhoff's laws; Loop and nodal methods of analysis; Star-delta transformation Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem

UNIT II

9

Analysis of Single Phase AC Circuits: Complex quantities, the operator J, Representation of vectors, forms of expression of complex quantities, complex expression of voltage, current and impedance, addition and subtraction of Steady State, AC fundamentals, Sinusoidal, square and triangular waveforms, Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series parallel RLC Circuits, Resonance in series and parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Causes and problems of low power factor, Concept of power factor improvement.

UNIT III

9

Transient State Analysis: Transient response of series RL circuit with alternating voltage source, Transient response Analysis of series RC circuit, Transient Response Analysis of series RLC circuit

Non sinusoidal waves: generation of non- sinusoidal waves, Fourier analysis, constants in Fourier series, Effective values of complex wave, power and power factor, Need of Earthing of equipment and devices, important electrical safety issues

UNIT IV

9

Three Phase AC Circuits: Three phase system its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three phase power

Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Mutual coupling with dot convention, Magnetic circuit calculations, Mutual inductance coupling coefficient.

EXPERIMENTS

1. Verification of Kirchhoff's law
2. Verification of Norton's theorem
3. Verification of Thevenin's theorem
4. Verification of Superposition theorem
5. Verification of Series R-L-C circuit
6. Verification of Parallel R-L-C circuit
7. Study of R-L-C series resonant circuit
8. Study of R-L-C Parallel resonant circuit

Books & References:

1. Electrical Circuit Analysis-K. S. Suresh Kumar (Pearson, 2013)
2. Basic Circuit Theory-Lawrence P. Huelsman (PHI, 3e)
3. Basic Electrical Engineering-T.K. Nagsakar & M.S. Sukhija (Oxford, 2e)
4. Network Theory: Analysis and Synthesis-Samarjit Ghosh (PHI)

ELECTRONICS & COMMUNICATION ENGINEERING DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

SUBJECTS OFFERED BY THE DEPARTMENT

Engineering Fundamentals & Department Core (Electronics & Communication Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
Year-I							
1.	BEC-01	Fundamentals of Electronics Engineering	-	3	1	2	5
2.	BEC-10	Electronics Workshop & PCB	-	0	0	4	2
Year-II							
3.	BEC-11	Network Analysis & Synthesis	-	3	1	0	4
4.	BEC-12	Digital Electronics & Circuits	-	3	1	2	5
5.	BEC-13	Signals & Systems	-	3	1	0	4
6.	BEC-14	Electromagnetic Field Theory	-	3	1	0	4
7.	BEC-15	Solid State Devices & Circuits	Solid State Devices & Circuits	3	1	2	5
Year-III							
8.	BEC-26	Control Systems	-	3	1	2	5
9.	BEC-27	Analog Integrated Circuits	-	3	1	2	5
10.	BEC-28	Principles of Communication	Signals & Systems	3	1	2	5
11.	BEC-29	Electronics Measurement & Instrumentation	-	3	1	2	5
12.	BEC-31	Digital Communication	Principles of Communication	3	1	2	5
13.	BEC-32	Microprocessors & Application	Digital Electronics & Circuits	3	1	2	5
14.	BEC-33	Data Communication Networks	Principles of Communication	3	1	0	4
15.	BEC-34	Microwave Engineering	Electromagnetic Field Theory	3	1	2	5
16.	BEC-35	VLSI Technology	-	3	1	0	4
17.	BEC-30	Seminar	-	0	0	6	3
Year-IV							
18.	BEC-41	VLSI Design	VLSI Technology	3	1	2	5
19.	BEC-42	Digital Signal Processing	Signals & Systems	3	1	0	4
20.	BEC-40	Project Part-I	-	0	0	10	5
21.	BEC-45	Industrial/ Practical Training	-	0	0	2	1
22.	BEC-43	Wireless Communication	Principles of Communication	3	1	0	4
23.	BEC-50	Project Part-II	Project Part-I	0	0	10	5

Programme Electives (Electronics & Communication Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
PE1 & PE2 (VII Semester)							
1.	BEC-51	RADAR Technology	Electromagnetic Field Theory	3	1	0	4

2.	BEC-52	Biomedical Instrumentation	Fundamentals of Electronics Engineering	3	1	0	4
3.	BEC-53	Information Theory & Coding	Digital Communication	3	1	0	4
4.	BEC-54	Advanced Semiconductor Devices	Solid State Devices & Circuits	3	1	0	4
5.	BEC-55	Optoelectronics	Solid State Devices & Circuits	3	1	0	4
6.	BEC-56	Electronics Switching	-	3	1	0	4
7.	BEC-57	Microcontroller & Embedded Systems	Digital Electronics & Microprocessors	3	1	0	4
8.	BEC-58	Satellite Communications	Principles of Communication	3	1	0	4
PE3 (VIII Semester)							
9.	BEC-61	Digital System Design Using VHDL	Digital Electronics & Circuits	3	1	2	5
10.	BEC-62	Optical Communications	Principles of Communication	3	1	2	5
11.	BEC-63	DSP Architecture & Applications	Digital Signal Processing & Microprocessor	3	1	2	5
12.	BEC-64	Antenna Design	Electromagnetic Field Theory	3	1	2	5
PE4 (VIII Semester)							
13.	BEC-65	Digital Image Processing	Signals & Systems, DSP	3	1	0	4
14.	BEC-66	ATM Networks and B-ISDN	Data Communication Networks	3	1	0	4
15.	BEC-67	RF ICs	Analog Integrated Circuits	3	1	0	4
16.	BEC-68	Neural Networks	-	3	1	0	4

SYLLABI

BEC-01 FUNDAMENTALS OF ELECTRONICS ENGINEERING 5 Credits (3-1-2)

UNIT I

9

Semiconductor materials and properties: electron-hole concepts, Basic concepts of energy bands in materials, concept of forbidden gap, Intrinsic and extrinsic semiconductors, donors and acceptors impurities, Junction diode, p-n junction, depletion layer, v-i characteristics, diode resistance, capacitance, diode ratings (average current, repetitive peak current, non-repetitive current, peak-inverse voltage). Diode Applications in rectifier, filters, voltage multipliers, load regulators, clipper and clamper circuits, Breakdown mechanism (Zener and avalanche), breakdown characteristics, Zener resistance, Zener diode ratings, Zener diode application as shunt regulator

UNIT II

9

Transistors(BJT and FET);Basic construction, transistor action, CB, CE and CC configurations, input/output characteristics, Biasing of transistors-fixed bias, emitter bias, potential divider bias, comparison of biasing circuits. Transistor Amplifier: Graphical analysis of CE amplifier, concept of voltage gain, current gain, h-parameter model (low frequency), computation of A_i , A_v , R_i , R_o of single transistor CE and CC amplifier configurations.

Field Effect Transistors(JFET and MOSFET): Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristic equation CG, CS and CD configurations, fixed & self-biasing.

MOSFET: depletion and enhancement type MOSFET-construction, operation and characteristics. Computation of A_v , R_i , R_o , of single FET amplifiers using all the three configurations

UNIT III**9**

Switching theory and logic design: Number systems, conversion of bases, Boolean algebra, logic gates, concept of universal gate, canonical forms, Minimisation using K-map

Operational Amplifiers

Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non-inverting and unity gain amplifiers, adders, difference amplifiers, integrators

UNIT IV**9**

Electronics Instruments: Working principle of digital voltmeter, digital multimeter (block diagram approach), CRO (its working with block diagram), measurement of voltage, current, phase and frequency using CRO

EXPERIMENTS

Minimum 8 experiments should be performed during semester

1. To Plot the forward /Reverse Characteristics of Si P-N junction diode.
2. To Plot the forward /Reverse Characteristics of Zener diode
3. Study and plot the characteristic of Zener diode as voltage regulator
4. Study of half wave rectifier and draw the nature of input / output signal. Calculate the value of I_{dc} , I_{rms} and ripple factor.
5. Study of Full wave rectifier and draw the nature of input / output signal. Calculate the value of I_{dc} , I_{rms} and ripple factor.
6. Study of Bridge Rectifier and draw the nature of input / output signal. Calculate the value of I_{dc} , I_{rms} and ripple factor.
7. Draw input output characteristic curve of n-p-n transistor in CE configuration
8. Draw input output characteristic curve of n-p-n transistor in CB configuration
9. Draw the drain and transfer curve of JFET
10. Study of OP-AMP (741) and calculate the gain in (i) Inverting mode and (ii) Non inverting mode
11. Study of OP-AMP as a (i) Summer (ii) Integrator (iii) Differentiator; and plot the nature of input & output waveform
12. Study of CRO and multi-meter measurement voltage, frequency, phase difference using CRO along with the testing of electronics component

Books & References:

1. Electronic Devices and Circuits - Boylestad and Nashelsky, 6th edition, PHI, 2001
2. Electronic Devices and Circuits, A Mottershead, PHI, 2000
3. Digital Computer Design, Morris Mano, PHI, 2003
4. Electronic Instrumentation-H.S. Kalsi, 2nd edition, TMH, 2007

BEC-10**ELECTRONICS WORKSHOP AND PCB****2 Credits (0-0-4)**

EXPERIMENTS

Note: Minimum 5 experiments should be performed during semester

1. Winding shop: Step down transformer winding of less than 5VA.
2. Soldering shop: Fabrication of DC regulated power supply.
3. Design a PCB using Etching & drilling.
4. Design a full wave centre tapped rectifier & study the effect of capacitive filter & its output on a virtual oscilloscope.
5. Design a RLC resonance circuit & verify the transient & phase response for different values of R, L & C.
6. Design a half adder using discrete components & verify the timing diagrams.
7. Convert the power supply circuit into PCB & simulates its 2D & 3D view
8. Coating of etched PCB to protect it from oxidation

MECHANICAL ENGINEERING DEPARTMENT
M. M. M. UNIVERSITY OF TECHNOLOGY
GORAKHPUR

SUBJECTS OFFERED BY THE DEPARTMENT

Engineering Fundamentals & Department Core (Mechanical Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
Year-I							
1.	BME-01	Engineering Mechanics	-	3	1	2	5
2.	BME-03	Manufacturing Processes	-	3	1	0	4
3.	BME-10	Workshop Technology	-	0	0	4	2
Year-II							
4.	BME-11	Material Science and Engineering	-	3	1	2	5
5.	BME-12	Engineering Thermodynamics	-	3	1	0	4
6.	BME-13	Measurement & Metrology	-	2	1	2	5
7.	BME-14	Mechanics of Solids	-	3	1	2	5
8.	BME-16	Fluid Mechanics	-	3	1	2	5
9.	BME-17	Kinematics of Machines	-	3	1	0	4
10.	BME-18	Energy Conversion Systems	-	3	1	2	5
11.	BME-20	Mechanical Engineering Drawing	Engineering Graphics	0	0	4	2
Year-III							
12.	BME-26	Machine Design-I	Mechanics of Solids	3	1	2	5
13.	BME-27	Heat and Mass Transfer	Engineering Thermodynamics	3	1	2	5
14.	BME-28	Dynamics of Machines	Kinematics of Machines	3	1	2	5
15.	BME-29	Manufacturing Science	Manufacturing Processes	3	1	2	5
16.	BME-30	Seminar	-	0	0	6	3
17.	BME-31	Machine Design-II	Mechanics of Solids	3	1	2	5
18.	BME-32	Refrigeration & Air conditioning	Heat and Mass Transfer	3	1	2	5
19.	BME-33	I C Engines and Compressors	Engineering Thermodynamics	3	1	0	4
20.	BME-34	Machine Tools & Machining	Manufacturing Science	3	1	0	4
21.	BME-35	Principles of Industrial Engineering	-	3	1	0	4
Year-IV							
22.	BME-40	Project Part-I	-	0	0	10	5
23.	BME-41	Automobile Engineering	I C Engines and Compressors	3	1	2	5
24.	BME-42	Computer Aided Design	-	3	1	2	5
25.	BME-43	Computer Aided Manufacturing	Manufacturing Science	3	1	2	5
26.	BME-45	Industrial/Practical Training	-	0	0	2	1
27.	BME-50	Project Part-II	-	0	0	10	5

Programme Electives (Mechanical Engineering)

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
PE1 & PE2 (VII Semester)							

1.	BME-51	Hydraulic Machines	Fluid Mechanics	3	1	2	5
2.	BME-52	Principles of Machine Tools Design	Manufacturing Science	3	1	0	4
3.	BME-53	Production Planning & Control	Principles of Industrial Engineering	3	1	0	4
4.	BME-54	Industrial Tribology	-	3	1	0	4
5.	BME-55	Total Quality Management	Principles of Industrial Engineering	3	1	0	4
6.	BME-56	Energy Management	-	3	1	0	4
7.	BME-57	Mechanical Vibrations	-	3	1	0	4
8.	BME-58	Renewable Energy systems	Engineering Thermodynamics	3	1	0	4
PE3 & PE4 (VIII Semester)							
9.	BME-61	Power Plant Technologies	Engineering Thermodynamics	3	1	0	4
10.	BME-62	Turbo Machinery	Engineering Thermodynamics	3	1	0	4
11.	BME-63	Project Management	-	3	1	0	4
12.	BME-64	Advanced Welding Technology	Manufacturing Science	3	1	0	4
13.	BME-65	Advanced Manufacturing Technology	Manufacturing Science	3	1	0	4
14.	BME-66	Advanced Engineering Materials	Material Science and Engineering	3	1	0	4
15.	BME-67	Advanced Mechanics of Solids	Mechanics of Solids	3	1	0	4
16.	BME-68	Gas Dynamics and Propulsion	Fluid Mechanics	3	1	0	4

Subjects offered for other departments

S.N.	Paper Code	Subject	Prerequisite Subject	L	T	P	Credits
1.	BME-02	Fundamentals of Mechanical Engineering	-	3	1	2	5
2.	BME-15	Engineering Materials	-	3	1	2	5

SYLLABI

BME-01	ENGINEERING MECHANICS	5 Credits (3-1-2)
---------------	------------------------------	--------------------------

UNIT I

Two-dimensional Force Systems 4

Basic Concepts, Laws of Mechanics, System of forces, Varignon's theorem, Transfer of a force to parallel position, Equivalent force system, Resultant of concurrent and non-concurrent force system, Free body diagrams, Equations of equilibrium, Applications

Friction and Applications 5

Introduction, Dry friction, Rolling friction, Fluid friction, Laws of Coulomb friction, Angle of friction, Cone of friction, Angle of repose, Equilibrium of bodies involving dry friction, Bodies resting on rough horizontal and inclined planes, Belt friction-Flat and V belt, Ratio of driving tensions for flat belt, Centrifugal tension, Initial tension, Condition of maximum power transmission

UNIT II

Beams 4

Introduction, Types of supports, Beams classification, Free body diagram, Shear force and bending moment, Analysis of beams, Continuous loading and discontinuous loading, Shear force and bending moment diagrams for concentrated and uniformly distributed loads

Properties of Plane Surfaces**5**

First moment of area, Centroid of a plane and composite bodies joined by different surfaces, Surface of revolution and volume of revolution, Moment of Inertia of area, Parallel axis theorem, Perpendicular axis theorem, Moment of inertia of composite bodies, Principal axes and principal moments of inertia, Mass moment of inertia of a thin rod, thin uniform plate, thin rectangular sheet, circular ring, thin disc, solid cylinder, sphere and cone about their axis of symmetry

UNIT III**Kinematics of a rigid body****5**

Introduction, Plane motion of a rigid body, Linear motion, Translation of a point with constant acceleration, Equation of motion due to gravity, Angular motion, Relation between angular displacement and angular velocity with constant angular acceleration, Curvilinear motion of a particle, Normal and tangential acceleration, General plane motion, Instantaneous centre of rotation

Kinetics of rigid body**4**

Introduction, Laws of motion, Kinetics of rigid bodies, Motion on inclined rough surface, Analysis of lift motion, Motion of two bodies connected by a string, Pure rotation of a rigid body, General motion of a rigid body, Work and energy, Linear and angular momentum, D'Alembert's principles

UNIT IV**Mechanics of Deformable Bodies****9**

Introduction, Normal and shear stresses, Poisson's ratio, Elastic constants and their relationships, Generalized Hooke's law, Deflection of bars of uniform and varying cross-sections, Strain energy in members due to static loading, Statically determinate problems, Stress-strain diagrams for ductile and brittle materials
Pure Bending of beams, Assumptions, Simple bending theory, Stress of beams of different cross sections
Torsion of Circular shafts, Shear stress due to torsion, Polar modulus, Power transmission

EXPERIMENTS**Note: Minimum Eight experiments are to be performed**

1. Tensile strength test on universal testing machine
2. Compressive strength test on universal testing machine
3. Impact test on Impact testing machine
4. Hardness testing of given specimen on Vicker/Brinell hardness testing machine
5. Torsion test of a rod on torsion testing machine
6. Determination of closed coil and open coil spring stiffness on spring testing machine
7. Experiments on friction between belt and pulley
8. Experiments on flywheel
9. Friction experiments on inclined plane/Screw jack
10. Experiments on bending of simple supported and cantilever beams
11. Statics experiments on equilibrium
12. Experiment on moment of inertia

Books and References:

1. Engineering Mechanics-S S Bhavikatti (New Age International)
2. Engineering Mechanics-H D Ram and A K Chauhan (McGraw Hill)
3. Engineering Mechanics-M. K. Harbola (Cengage Learning)
4. Engineering Mechanics-Jaget Babu (Pearson)
5. Engineering Mechanics – R. K. Bansal (Laxmi Publications)
6. Engineering Mechanics-D S Kumar (Katson)

BME-02**FUNDAMENTALS OF MECHANICAL ENGINEERING****5 Credits (3-1-2)**

UNIT I**Thermodynamics****5**

First and second law of thermodynamics, statements of Second Law of Thermodynamics and their equivalence, Third law of thermodynamics, Steam properties, Steam processes at constant pressure, volume, enthalpy and

entropy, Classification of steam boilers, Efficiency and performance analysis, Refrigeration, Vapour compression and vapour absorption cycles, Coefficient of performance (COP), Refrigerant properties

Reciprocating Machines 4

Steam engines, hypothetical and actual indicator diagrams, Carnot cycle, Otto and Diesel cycles, Working of two and four strokes petrol and diesel IC engines.

UNIT II

Measurement & Metrology 5

Introduction to measurement and measuring instruments, Types of sensors, Types of transducers and their characteristics, Measurement error and uncertainty analysis, Temperature, pressure, velocity, flow, strain, force and torque measurement, Measurement by dial gauges, slip gauges and sine bar

Engineering Materials 4

Classification, Ferrous and non ferrous metals, Composition of cast iron and carbon steel, mechanical properties, alloy steel and mechanical properties, Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications.

UNIT III

Simple Stress and Strain 5

Introduction, Normal and shear stresses, Poisson's ratio, Elastic constants and their relationships, Generalized Hooke's law, Deflection of bars of uniform and varying cross-sections, Strain energy in members due to static loading, Statically determinate problems, Stress-strain diagrams for ductile and brittle materials

Mechanical Properties and Testing 4

Toughness, Hardness, Fracture, Fatigue and Creep, Strength and deformation testing, Bend/rebend testing, Hardness testing, Impact testing, Fatigue testing and creep testing, spring stiffness testing

UNIT IV

Beams 5

Introduction, Types of supports, Beams classification, Free body diagram, Shear force and bending moment, Analysis of beams, Continuous loading and discontinuous loading, Shear force and bending moment diagrams for statically determinate beams

Pure Bending of beams 2

Introduction, Assumptions, Simple bending theory, Stress of beams of different cross sections

Torsion of Circular shafts 2

Introduction, Torsion of circular shafts, Shear stress due to torsion, Polar modulus, Power transmission

EXPERIMENTS

Note: Minimum Eight experiments are to be performed

1. Tensile strength test on universal testing machine
2. Compressive strength test on universal testing machine
3. Experiment on bend/rebend testing machine
4. Impact test on Impact testing machine
5. Hardness testing of given specimen on Vicker/Brinell hardness testing machine
6. Torsion test of a rod on torsion testing machine
7. Determination of closed coil and open coil spring stiffness on spring testing machine
8. Study of two stroke and four stroke engine
9. Study of slider crank mechanism
10. Experiment on fatigue testing machine
11. Experiments on bending of simple supported and cantilever beams
12. Study of steam boilers
13. Study of domestic refrigerator

Books and References:

1. Basic and Applied Thermodynamics-P. K. Nag (Tata Mc Graw Hill)
2. Applied Thermodynamics-Onkar Singh (New Age International)
3. Elements of Materials science and Engineering-Van Vlash (Jhon Wiley & Sons)
4. Material Science-V. Raghvan (Prentice Hall)
5. Mechanical Measurement-G. Beckwith Thomas (Narosa Publishing House)
6. Mechanical Measurement, Sirohi (New Age Publications)
7. Strength of Materials-S. Ramamurtham (Dhanpat Rai Publishing Co.)

8. Strength of Materials-R. K. Rajput (S. Chand)
9. Strength of Materials–R. K. Bansal (Lakshmi Publications)

BME-10 WORKSHOP TECHNOLOGY

2 Credits (0-0-4)

Note: Make at least one job in each shop

1. Introduction

- Need and importance of workshop
- Mechanical Properties of Metals
- Ferrous Metals and alloys- composition and applications
- Non-Ferrous Metals and alloys- composition and applications
- Safety in each shop

2. Carpentry Shop:

- Draw layout of carpentry shop
- Study of tools & operations and carpentry joints.
- Prepare half-lap corner joint, mortise & tennon joints
- Simple exercise on woodworking lathe

3. Fitting Shop:

- Layout of Fitting shop
- Study of tools & operations
- Simple exercises involving fitting work.
- Simple exercises involving drilling/tapping/dieing

4. Black Smithy Shop:

- Layout of Smithy Shop
- Study of tools & operations
- Hot working and cold working
- Simple exercises base on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

5. Welding Shop:

- Layout of Welding shop
- Study of Equipments of Gas welding & Arc welding
- Simple butt and Lap welded joints.
- Oxy-acetylene flame cutting

6. Sheet-metal Shop:

- Layout of Sheet metal shop
- Metals used in sheet metal work such as Galvanised iron, Copper sheet, Aluminium sheet
- Study of tools & operations
- Fabrication of Funnel, tool-box, tray, electric panel box etc.

7. Machine Shop:

- Layout of Machine shop
- Study of Lathe, Drilling, Shaper, Planer and Milling Machines and commonly done operations on these machines
- Single point and Multi-point Cutting tools
- Making a job on lathe involving plane turning, step turning, taper turning, and threading operations

8. Foundry Shop:

- Layout of fitting shop
- Study of tools & operations
- Study on pattern allowances
- To prepare a Mould with the use of a core and cast it
- Casting defects

OPEN ELECTIVES

S.N.	Department	Paper Code	Subject	L	T	P	Credits
1.	ASD	BOE-01	Laser Systems & Applications	2	1	0	3
2.	ASD	BOE-02	Nuclear Science	2	1	0	3
3.	ASD	BOE-03	Operations Research	3	1	0	4
4.	CED	BOE-04	Principles of Remote Sensing	2	1	0	3
5.	CED	BOE-05	Disaster Management	2	1	0	3
6.	CED	BOE-06	Solid Waste Management	2	1	0	3
7.	CSED	BOE-07	Introduction to Data and File Structures	2	1	2	4
8.	CSED	BOE-08	Introduction to Web Technology	2	1	2	4
9.	CSED	BOE-09	Linux & Shell Programming	2	1	2	4
10.	EED	BOE-10	Non-Conventional Energy Sources	2	1	0	3
11.	EED	BOE-11	Fundamentals of Electric Drives	2	1	0	3
12.	ECED	BOE-13	Industrial Automation & Robotics	2	1	0	3
13.	ECED	BOE-14	Industrial Electronics	2	1	0	3
14.	ECED	BOE-15	Electronic Product Design	2	1	0	3
15.	MED	BOE-16	Quality Management	2	1	0	3
16.	MED	BOE-17	Reliability & Maintenance Engineering	2	1	0	3
17.	MED	BOE-18	Industrial Pollution & Control	2	1	0	3
18.	MBA	BOE-19	Entrepreneurship Development	2	1	0	3
19.	MBA	BOE-20	Organisation Behaviour and Personnel Management	2	1	0	3
20.	MBA	BOE-21	Principles of Management	2	1	0	3

SYLLABI