Minutes of the meeting of the Senate of MNNIT, Allahabad held on (Friday) 24.06.2005 at 10.30 A.M. in the Conference Room of the Institute.

Following members were present:

1.	Prof. B.D. Chaudhary, Director	In the chair
2.	Prof. R.N. Shahi	Member
3.	Prof. Krishna Kant	"
4.	Prof. Satish Chand	"
5.	Prof. S.K. Agrawal	"
6.	Prof. Satya Sheel	"
7.	Prof. Triloki Nath	"
8.	Prof. V.K. Nema	"
9.	Prof. Rakesh Mathur	"
10.	Prof. R.C. Mehta	"
11.	Prof. P.K. Mishra	"
12.	Dr. Geetika, MMS	"
13.	Prof. S.K. Duggal	"
14.	Prof. Mahesh Chandra	"
15.	Prof. Dinesh Chandra	"
16.	Prof. R.K. Srivastava, MED	"
17.	Prof. Peetam Singh	"
18.	Prof. Vineeta Agarwal	"
22.	Dr. N.D. Pandey,Chairman,SUGC	"
23.	Dr. Sanjay Chaubey	"
21.	Dr. Rajeev Tripathi, ECED	"
22.	Dr. K.K. Shukla, AMD	"
23.	Dr. M.M. Gore, CSED	"
24.	Dr. Rakesh Narain, MED	"
25.	Sri R.P. Tiwari	Registrar/Secretary

Following decisions were taken:

- The Chairman Senate welcomed the new members namely Prof. Rajeev Tripathi, Prof. K.K. Shukla, Prof. M.M. Gore & Prof. Rakesh Narain.

- The Senate confirmed the minutes of previous meeting held on 12.1.05 and the emergent meeting held on 24.4.05.

- The Senate considered and approved the proposed modifications in UG/PG manual. The details of modifications are as given below:

2.3 Eligibility for Admission

Existing

3. In each programme 15 percent seats are reserved for the Scheduled Castes candidate, and 7.5 percent seats are reserved for the Scheduled Tribes candidates or as prescribed by GOI from time to time.

Modified as

In each programme 15 percent seats are reserved for the Scheduled Castes candidate, 7.5 percent seats are reserved for the Scheduled Tribes candidates and 3% seats are reserved for physically handicapped candidates or as prescribed by GOI from time to time

2.3.2. MMS/MBA-IBIT

Existing

The candidates must have a Bachelors degree in Engineering/Technology/Science or equivalent degree with Maths/Economics as one of the subject in BSc.

Modified as

The candidates must have a Bachelors degree in Engineering/Technology/Science or equivalent degree with Maths/Economics as one of the subject, in qualifying examination.

7.7. Academic Performance Requirement.

Existing

4. iii) he/she obtains two Fs or two Es or one F and one E in the same or different courses.

Modified as

iii) he/she obtains two Fs or two Es or one F and one E in the same semester.

Existing

5. iii) he/she obtains two Fs or two Es or one F and one E in the same or different courses.

Modified as

iii) he/she obtains two Fs or two Es or one F and one E in the same semester.

- The Senate approved the lists of students of B.Tech., MCA & MMS for the award of Degree in the Convocation 2005.

  However the list of students of M.Tech. could not be approved since their result will be declared after July 4, 2005 as the final Defense of majority of students will be over by July 4, 2005. The Senate authorized the Chairman Senate to approve the list after it is ready.

- The Senate considered the request of Physics Department for changing the curriculum of Physics and approved the change. Now the Practical periods will be 3 in alternate week. This will not effect the No. of credit allocated to the subjects.

	Existing				Modified			
	L	T	P	Credit	L	T	P	Credit
Physics	3	1	3	5	3	1	3/2	5

- The Senate considered the proposal of, The Head, Electrical Engineering Department that the Summer Internship/Summer Project/Entrepreneurial skill development training (EE 975) after M.Tech. II semester should be included in III semester and not in II semester. The Senate approved the proposal with immediate effect.

- The Senate considered and approved the modifications in the eligibility for admission to MCA Programme suggested by the Dept. of Computer Science & Engg. and approved it.

- The Senate considered the mercy appeal of MCA students who have already completed sixth semester and are Academically Deficient. The Senate decided to arrange a special Semester of 10 weeks starting in the Ist week of July, 2005.

- The Senate considered the cases of B.Tech. students who have to under go practical training and also they have to register in Summer Semester for clearing papers or improve their SPI/CPI to secure a minimum CPI of 5.0, and decided that such students should have their training in the institute itself.

- The Senate considered the proposal of starting new M.Tech. Programs in the institute, by different departments as detailed below and approved the same.

1.	M.Tech. in Product Design & Development	(MED)	Annexure-1
2.	M.Tech. in Information Security	(CSED)	Annexure-2
3.	M.Tech. in GIS and Remote Sensing	(CSED)	" "

- The Senate considered and approved the amendments/changes in scheme/syllabi of following existing M.Tech. programs.

1.	M.Tech. in Material Science and Engineering	(AMD)	Annexure-3
2.	M.Tech. in Computer Science and Engineering	(CSED)	Annexure-4
3.	M.Tech. in Software Engineering	(CSED)	" "
4.	M.Tech. in Mechanical Engineering (Design)	(MED)	Annexure-5
5.	M.Tech. in Mechanical Engg. (Production Engg.)	(MED)	" "
6.	M.Tech. in Mechanical Engg. (CAD/CAM)	(MED)	" "

- The Senate considered and approved the modification and changes in the ordinances for MCA program in PG manual. (Annexure-6)

- Senate considered the applications of following M.Tech. students for leave of the semester and allowed for the same.
  1. Man Singh Bharti (Enroll. No.2000EL13) of M. Tech. Electronics (Digital System)
  2. Sanjay Kumar Dewangan (2003PR05) of M.Tech.Mechanical Engg. (Production Engg.)
  3. Satish Kumar Veloga (2002CC06) of M.Tech.Mechanical Engg. (CAD/CAM)

- The request of Mr. G.P. Sahu to continue M.Tech. Programme which he left mid way and joined IIT Delhi, after he comes back from IIT Delhi after defending Ph.D. thesis there was considered. The Senate rejected the request to continue in M.Tech. Proramme.

- The Senate considered the mercy appeal of Sri Shyama Prasad Acharya an expelled student of the institute to allow him to take admission in the institute, and rejected it.

- Senate considered and approved the proposal to start B.Tech. program in Chemical Engg. prepared jointly by MED/AMD from session 2006-07.

- Senate considered and approved the proposal to start B.Tech. program in Printing Technology prepared by MED from session 2006-07.

- The Senate considered the case of Rahul S. Khobragade (Enrollment No. 1999361) for allowing him to register in B.Tech. VII semester although he is having one Practical Lab. of B.Tech. IInd year to clear. The Senate allowed him to register in VII semester and clear the Practical Lab. Course of IInd year together with VII semester, as a special case.

- The Senate considered the following Open Electives proposed by O.C. Time Table for VII semester (2005-06) and approved them.

Sl.No.	Name of Subjects	Name of the Departments
1.	Non Conventional Energy Sources	Mech. Engg. Deptt.
2.	Acoustics & Noise Engineering	-do-
3.	Fundamental of Bio-Medicals	App. Mech. Deptt.
4.	Environmental Impact	Civil Engg. Deptt.
5.	Accountancy & Financial Management	Humanities & Social Sciences Deptt.
6.	Entrepreneurship	-do-
7.	Social Psychology	-do-
8.	International Business Management	School of Management Studies

Approved
Bhandhu

(R.P. Tiwari)
Registrar

ANNEXURE-1

Course Structure for M. Tech. Mechanical Engineering (Product Design and Development)

S. No.	Code	Subject	L	T	P	Credit
First Semester						
1	ME-917	Product Design and Development-I	3	-	-	3
2	ME-918	Materials and Manufacturing Technology	3	-	-	3
3	ME-919	CAD/CAM in Product Development	3	1	-	4
4	ME-925	Project-1	3	-	-	3
5	ME-923	Programming and Software Practices	2	-	2	3

S. No.	Code	Subject	L	T	P	Credit
Second Semester						
1	ME-921	Product Design and Development-II	3	1	-	4
2	ME-922	Applied Ergonomics	3	-	-	3
3	ME-951	Rapid Prototyping and Manufacturing	3	-	-	3
4	ME-926	Project-2	3	-	-	3
5		Elective-1	-	-	-	3

S. No.	Code	Subject	L	T	P	Credit
Third Semester						
1	ME-924	Design for Manufacturing and Assembly	3	-	-	3
2		Elective-II	3	-	-	3
3	ME-907	Seminar	-	-	-	2
4	ME-998	State of Art Seminar	-	-	-	2
5	ME-999	Thesis	-	-	-	6

S. No.	Code	Subject	L	T	P	Credit
Fourth Semester						
1	ME-999	Thesis	-	-	-	16

List of Electives
For
M.Tech. (Common for all Specialization)

1.	ME-951	Rapid Prototyping and Manufacturing (Only for CAD/CAM/Production and Design)
2.	ME-952	Product Development (Only for CAD/CAM/Production and Design)
3.	ME-953	Reverse Engineering
4.	ME-954	Nanotechnology
5.	ME-955	Precision Engineering
6.	ME-956	Concurrent Engineering (Only for CAD/CAM/Production and Design)
7.	ME-957	Artificial Intelligence in Engineering
8.	ME-958	Evolutionary Algorithms
9.	ME-959	Systems Dynamics
10.	ME-960	Flexible Manufacturing Systems
11.	ME-961	Design Against Fatigue and Fracture
12.	ME-962	Noise and Vibration
13.	ME-963	Computer Graphics
14.	ME-964	Turbo Pumps Design
15.	ME-965	Design of Mechanical Systems
16.	ME-966	Tool Design
17.	ME-967	Logistics and Supply Chain Design
18.	ME-968	Machine Tool Dynamics
19.	ME-969	Advanced Welding Technology
20.	ME-970	Modeling and Simulation in Engineering
21.	ME-971	Total Quality Management
22.	ME-972	Ergonomics (Only for CAD-CAM/Production and Design)
23.	ME-973	Design for Manufacturing (Only for CAD-CAM/Production and Design)
24.	ME-974	Micro Electrical Mechanical Systems
25.	ME-975	Market Research and Forecasting
26.	ME-976	Management of Technology and Innovation
27.	ME-902	Computer Aided Design (Only for Production)
28.	ME-903	Computer Aided Manufacturing (Only for Design)
29.	ME-901	Finite Element Method (Only for Product Design and Development)
30.	ME-905	Mechatronics
31.	ME-906	Computer Integrated Manufacturing (Only for Design/Production and Product Design & Development)
32.	ME-909	Robotics (Only for Design and Product Design & Development)
33.	ME-920	Advanced Manufacturing Technology (Only for CAD-CAM/Design and Product Design & Development)

ANNEXURE-2

Ordinance and Course Structure
For
M.Tech. (Information Security)
Full-Time and Part-Time Programs

1. Eligibility

(A) M.Tech. in Information Security(Full-Time)

The candidates having Bachelor's degree in Engineering in the branches of Computer Science and Engineering or Information Technology or Electronics and Communication Engineering or equivalent are eligible for admission to M.Tech. in Information Security. Further, candidates having M.Sc. (Computer Science) or Master of Computer Application are also eligible for the admission.

The candidates have to full-fill the additional academic requirements at the time of admission as specified by the department.

(B) M.Tech. in Information Security (Part-Time)

Eligibility qualification is as above in (A). In addition, the candidate must have two years of teaching experience.

2. Credit Hours Required

Credit Hours and performance criterion are to be followed as given in Article 7.1 and 7.7 of PG ordinances, salient points of which are reproduced below :

(a) The minimum credit hours required for the award of the M.Tech degree is 64. Out of these minimum of 32 need to be credited through course work and 32 through the M.Tech. thesis work.
(b) These 64 credit hours may be earned through maximum of Six Semesters and minimum of Four Semesters.
(c) For Part Time Students 64 credit hours may be earned through maximum of Ten Semesters and minimum of Six Semesters.
(d) The preferred credit hours per semester are 16. However, a student can register for minimum of 8 credit hours and maximum of 20 credit hours.
(e) There is a provision of two semester leave in the duration of the M.Tech. program.
(f) The students have to maintain CPI (Cumulative Performance Index) of 6.0 (out of 10) and SPI (Semester Performance Index) of 5.5 (out of 10) in every semester to continue in the M.Tech. program.

3. Program Structure

(i) For Full-Time Program

Each semester is of 16 credits.
Each elective contains list of courses.
Each course in the elective list is of 4 credits.

(ii) For Part-Time Program

Each Semester is minimum of 8 credits.
Each elective contains list of courses.
Each course in the elective list is of 4 credits.

(A) M.Tech. (Information Security) Program (Full-Time)

Semester 1 :

S.No.	Course Title	Course Code	Credit
1.	Elective 1 (Security Pool)	See Annexure - 1	4
2.	Elective 2 (Computer Pool)	See Annexure - 2	4
3.	Elective 3 (Computer Pool)	See Annexure - 2	4
4.	Elective 4 (Information Management Pool)	See Annexure - 3	4

Semester 2 :

S.No.	Course Title	Course Code	Credit
1.	Elective 5 (Information Management Pool)	See Annexure - 3	4
2.	Elective 6 (Security Pool	See Annexure - 1	4
3.	Elective 7 (Computer Pool)	See Annexure - 2	4
4.	Elective 8 (Security Pool)	See Annexure - 1	4

Semester 3 :

S.No.	Course Title	Course Code	Credit
1.	Seminars on Secuirty	IS381	4
2.	Thesis-1	IS382	12

Semester 4 :

S.No.	Course Title	Course Code	Credit
1.	Thesis-2	IS481	16

(B) M.Tech. (Information Security) Program (Part-Time)

Semester 1 :

S.No.	Course Title	Course Code	Credit
1.	Elective 1 (Security Pool)	See Annexure - 1	4
2.	Elective 2 (Computer Pool)	See Annexure - 2	4

Semester 2 :

S.No.	Course Title	Course Code	Credit
1.	Elective 5 (Information Management Pool)	See Annexure - 3	4
2.	Elective 6 (Security Pool)	See Annexure - 1	4

Semester 3 :

S.No.	Course Title	Course Code	Credit
1.	Elective 3 (Computer Pool)	See Annexure - 2	4
2.	Elective 4 (Information Management Pool)	See Annexure - 3	4
3.	Seminars on Security Issues	IS381	4

Semester 4 :

S.No.	Course Title	Course Code	Credit
1.	Elective 7 (Computer Pool)	See Annexure - 2	4
2.	Elective 8 (Security Pool)	See Annexure - 1	4

Semester 5 :

S.No.	Course Title	Course Code	Credit
2.	Thesis-1	IS382	12

Semester 6 :

S.No.	Course Title	Course Code	Credit
1.	Thesis-2	IS481	16

Annexure - 1

List of Electives (Security Pool)

Sl.No.	Course Code	Course Title	L	T	P	C
1	IS171	Introduction to Computer Security	4	0	0	4
2	IS172	Cryptography Foundations	4	0	0	4
3	IS173	Intrusion Detection Techniques	3	0	2	4
4	IS174	Public Key Infrastructure and Trust Management	3	0	2	4
5	IS175	Wireless Network Security	3	0	2	4
6	IS176	Biometric Security	3	0	2	4
7	IS177	Secure E-Commerce	4	0	0	4
8	IS178	Optical Network Security	4	0	0	4

Annexure - 2

List of Electives (Computer Pool)

Sl.No.	Course Code	Course Title	L	T	P	C
1	IS181	Advanced Computer Networks	4	0	0	4
2	IS182	Advance Database Systems	4	0	0	4
3	IS183	Embedded Systems	4	0	0	4
4	IS184	Advanced Operating System Design	4	0	0	4
5	IS 185	Software Project Management	4	0	0	4
6	IS 186	Mobile Networking and Computing	4	0	0	4
7	IS 187	Advanced Data Modeling	4	0	0	4
8	IS188	Topics in Image Processing	4	0	0	4

Annexure - 3

List of Electives (Information Management Pool)

Sl.No.	Course Code	Course Title	L	T	P	C
1	IS191	Information Security Risk Management	4	0	0	4
2	IS192	Decision Support Systems and Methods	4	0	0	4
3	IS193	Cyber Laws	4	0	0	4
4	IS194	Intellectual Property Rights	4	0	0	4
5	IS 195	Computer Security Audit and Assurance	4	0	0	4

Thesis & Seminar

Sl.No.	Course Code	Course Title	Credit
1.	IS381	Seminars on Information Security	4
2.	IS382	Thesis-1	12
3.	IS481	Thesis-2	16

Ordinance and Course Structure
For
M.Tech. (GIS and Remote Sensing)
Full-Time and Part-Time Programs

1. Eligibility

(A) M.Tech. in GIS and Remote Sensing(Full-Time)

The candidates having Bachelor's degree in Engineering in the branches of Computer Science and Engineering or Information Technology or Electronics and Communication Engineering or Civil Engineering or equivalent are eligible for admission to M.Tech. in **GIS and Remote Sensing**. Further, candidates having M.Sc. (Computer Science) or Master of Computer Application are also eligible for the admission.

The candidates have to full-fill the additional academic requirements at the time of admission as specified by the department.

(B) M.Tech. in GIS and Remote Sensing (Part-Time)

Eligibility qualification is as above in (A). In addition, the candidate must have two years of teaching experience.

2. Credit Hours Required

Credit Hours and performance criterion are to be followed as given in Article 7.1 and 7.7 of PG ordinances, salient points of which are reproduced below :

(a) The minimum credit hours required for the award of the M.Tech degree is 64. Out of these minimum of 32 need to be credited through course work and 32 through the M.Tech. thesis work and seminar.
(b) These 64 credit hours may be earned through maximum of Six Semesters and minimum of Four Semesters.
(c) For Part Time Students 64 credit hours may be earned through maximum of Ten Semesters and minimum of Six Semesters.
(d) The preferred credit hours per semester is 16. However, a student can register for minimum of 8 credit hours and maximum of 20 credit hours.
(e) There is provision of two semester leave in the duration of the M.Tech. program.
(f) The students have to maintain CPI (Cumulative Performance Index) of 6.0 (out of 10) and SPI (Semester Performance Index) of 5.5 (out of 10) in every semester to continue in the M.Tech. program.

3. Program Structure

(i) For Full-Time Program

Each semester is of 16 credits.
Each elective contains list of courses.
Each course in the elective list is of 4 credits.

(ii) For Part-Time Program

Each Semester is minimum of 8 credits.
Each elective contains list of courses.
Each course in the elective list is of 4 credits.

(A) M.Tech. (GIS and Remote Sensing) Program (Full-Time)

Semester 1 :

S.No.	Course Title	Course Code	Credit
1.	Elective 1 (GIS Pool)	See Annexure - 1	4
2.	Elective 2 (Computer Pool)	See Annexure - 2	4
3.	Elective 3 (Computer Pool)	See Annexure - 2	4
4.	Elective 4 (GIS Pool)	See Annexure - 1	4

Semester 2 :

S.No.	Course Title	Course Code	Credit
1.	Elective 5 (GIS Pool)	See Annexure - 1	4
2.	Elective 6 (Computer Pool	See Annexure - 2	4
3.	Elective 7 (Computer Pool)	See Annexure - 2	4
4.	Elective 8 (GIS Pool)	See Annexure - 1	4

Semester 3 :

S.No.	Course Title	Course Code	Credit
1.	Seminars on GIS and Remote Sensing	GR381	4
2.	Thesis-1	GR382	12

Semester 4 :

S.No.	Course Title	Course Code	Credit
1.	Thesis-2	GR481	16

(B) M.Tech. (GIS and Remote Sensing) Program (Part-Time)

Semester 1 :

S.No.	Course Title	Course Code	Credit
1.	Elective 1 (GIS Pool)	See Annexure - 1	4
2.	Elective 2 (Computer Pool)	See Annexure - 2	4

Semester 2 :

S.No.	Course Title	Course Code	Credit
1.	Elective 5 (GIS Pool)	See Annexure - 1	4
2.	Elective 6 (Computer Pool)	See Annexure - 2	4

Semester 3 :

S.No.	Course Title	Course Code	Credit
1.	Elective 3 (Computer Pool)	See Annexure - 2	4
2.	Elective 4 (GIS Pool)	See Annexure - 1	4
3.	GIS & Remote Sensing	GR381	4

Semester 4 :

S.No.	Course Title	Course Code	Credit
1.	Elective 7 (Computer Pool)	See Annexure - 2	4
2.	Elective 8 (GIS Pool)	See Annexure - 1	4

Semester 5 :

S.No.	Course Title	Course Code	Credit
2.	Thesis-1	GR382	12

Semester 6 :

S.No.	Course Title	Course Code	Credit
1.	Thesis-2	GR481	12

Annexure - 1

List of Electives (GIS Pool)

Sl.No.	Course No.	Course Title	L	T	P	C
1	GR171	Introduction to Geomorphology	4	0	0	4
2	GR172	Geographic Information System	3	0	2	4
3	GR173	Computer Processing of Remotely Sensed Data	3	0	2	4
4	GR174	Urban and Regional Planning	4	0	0	4
5	GR175	Watershed Development Management	3	0	2	4
6	GR176	Natural Resource Management	3	0	2	4
7	GR177	Disaster Management	4	0	0	4
8	GR178	Web GIS	4	0	0	4
9	GR179	Agriculture Monitoring	4	0	0	4

Annexure - 2

List of Electives (Computer Pool)

Sl.No.	Course No.	Course Title	L	T	P	C
1	GR181	Advanced Computer Networks	4	0	0	4
2	GR182	Advance Database Systems	4	0	0	4
3	GR183	Embedded Systems	4	0	0	4
4	GR184	Advanced Operating System	4	0	0	4
5	GR185	Software Project Management	4	0	0	4
6	GR186	Data Warehousing & Mining	4	0	0	4
7	GR187	Advanced Data Modeling	4	0	0	4
8	GR188	Topics in Image Processing	4	0	0	4
9.		Thesis & Seminars				

Thesis & Seminar

Sl.No.	Course Code	Course Title	Credit
1.	GR381	Seminars on GIS & Remote Sensing	4
2.	GR382	Thesis-1	12
3.	GR481	Thesis-2	16

ANNEXURE-3

Applied Mechanics Department

Scheme of Examination and Revised Syllabus

M.Tech. Material Science and Engineering

Exiting

Ist Semester

Course No.	Subject Name	L	T	P	Credits	Distribution of marks out of 100			
						TA	I Mid Exam	II Mid Exam	End Sem. Exam
AM 551	Mechanical Behaviour and Fracture Mechanics	3	0	0	3	20	20	20	40
AM 552	Characterization of Materials	4	0	0	4	20	20	20	40
AM 503	Mechanics of Composite Materials	3	0	0	3	20	20	20	40
AM 561	Crystallography and Crystal Structure	3	0	0	3	20	20	20	40
AM 553	Thermodynamics and Phase Equilibrium	3	0	0	3	20	20	20	40

Total Credits = 16

Proposed

Ist Semester

Course No.	Subject Name	L	T	P	Credits	Distribution of marks out of 100			
						TA	I Mid Exam	II Mid Exam	End Sem. Exam
AM 552	Characterization of Materials	4	0	0	4	20	20	20	40
AM 553	Thermodynamics and Phase Equilibrium	3	0	0	3	20	20	20	40
AM 554	**Polymer Science and Engineering**	**3**	**0**	**0**	**3**	**20**	**20**	**20**	**40**
AM 556	**Ceramics and Ceramic Technology**	**3**	**0**	**0**	**3**	**20**	**20**	**20**	**40**
AM 571	**Metallurgy and Powder Metallurgy**	**3**	**0**	**0**	**3**	**20**	**20**	**20**	**40**

Total Credits = 16

2nd Semester

Course No.	Subject Name	L	T	P	Credits	Distribution of marks out of 100			
						TA	I Mid Exam	II Mid Exam	End Sem. Exam
AM 554	Polymer Science and Engineering	3	0	0	3	20	20	20	40
AM 564	Electrical, Electronic and Magnetic Behaviour of Materials	4	0	0	4	20	20	20	40
AM5 56	Ceramics and Ceramic Technology	3	0	0	3	20	20	20	40
AM	Elective I	3	0	0	3	20	20	20	40
AM	Elective II	3	0	0	3	20	20	20	40

Total Credits = 16

Semester 3 & 4 (16 Cradit each)

Special Study/Summer Project
Dissertation by Research.

2nd Semester

Course No.	Subject Name	L	T	P	Credits	Distribution of marks out of 100			
						TA	I Mid Exam	II Mid Exam	End Sem. Exam
AM 551	**Mechanical Behaviour and Fracture Mechanics**	**3**	**0**	**0**	**3**	**20**	**20**	**20**	**40**
AM 564	Electrical, Electronic and Magnetic Behaviour of Materials	4	0	0	4	20	20	20	40
AM 503	**Mechanics of Composite Materials**	**3**	**0**	**0**	**3**	**20**	**20**	**20**	**40**
AM	Elective I	3	0	0	3	20	20	20	40
AM	Elective II	3	0	0	3	20	20	20	40

Total Credits = 16

Semester 3 & 4 (16 Cradit each)

Special Study/Summer Project
Dissertation by Research.

Semester 1:

- AM551 Mechanical Behaviour and Fracture Mechanics
- AM552 Characterization of Materials
- AM503 Mechanics of Composite Materials
- AM561 Crystallography and Crystal Structure
- AM553 Thermodynamics and Phase Equilibrium

Semester 2:

- AM554 Polymer Science and Engineering
- AM564 Electrical, Electronic and Magnetic Behaviour of Materials
- AM556 Ceramic and Ceramic Technology
- Elective I
- Elective II

Electives:

- AM562 Powder Metallurgy
- AM555 Information Technology in Material Science
- AM563 Nuclear Materials
- AM565 Advanced and Emerging Materials for Industry
- AM566 Bio-Medical Materials
- AM567 Nano-materials and Nano-technology
- AM568 Failure Analysis
- AM514 Composite Structures
- AM569 Corrosion and Oxidation
- AM570 Advances in Material Science (Through Seminars)
- AM508 Finite Element analysis

Semester 3 & 4:

Special Study/Summer Project
Dissertation by Research.

Semester 1:

- AM552 Characterization of Materials
- AM553 Thermodynamics and Phase Equilibrium
- AM554 Polymer Science and Engineering
- AM556 Ceramic and Ceramic Technology
- AM571 Metallurgy and Powder Metallurgy

Semester 2:

- AM551 Mechanical Behaviour and Fracture Mechanics
- AM564 Electrical, Electronic and Magnetic Behaviour of Materials
- AM503 Mechanics of Composite Materials
- Elective I
- Elective II

Electives:

- AM555 Information Technology in Material Science
- AM563 Nuclear Materials
- AM565 Advanced and Emerging Materials for Industry
- AM566 Bio-Medical Materials
- AM567 Nano-materials and Nano-technology
- AM568 Failure Analysis
- AM514 Composite Structures
- AM569 Corrosion and Oxidation
- AM570 Advances in Material Science (Through Seminars)
- AM508 Finite Element analysis

Semester 3 & 4:

Special Study/Summer Project
Dissertation by Research.

APPLIED MECHANICS DEPARTMENT

REVISED SYALLABUS FOR M. Tech. MATERIAL SCIENCE AND ENGG.

(Ist SEMESTER) 2005-2006

AM-522 CHARACTERISATION OF MATERIALS

Introduction:

Basic atomic and crystal structure, unit cells, space lattice, bravis lattice, miller indices, crystal defects.

Crystallography :

External form, crystallization, crystal growth, internal order in crystals, symmetry elements (without translation), resume of symmetry operation without translation, crystal morphology, crystal symmetry, crystallographic axes, form, zones, crystal habbits, crystal projections, spherical projection, stereographic projection, the thirty two crystal classes, triclinic system, monoclinic system, orthorhombic system, tetragonal system, hexagonal system, isometric system, crystal structure of magnetic ceramics (spinels, normal and inverse spinels, spinels solid solution distorted spinels, garnet and garnet solid solutions), quasi crystals.

Crystallography internal order and symmetry , HM notations, magnetic symmetry, translation directions and distances, one dimensional order (rows), two dimensional orders (plane lattice), rotation angle restriction, symmetry contents of planer motifs, symmetry content of plane lattices, two dimensional plane groups, three dimensional lattices, space groups, crystal structures, determination of crystal structures, illustrations of crystal structures, *Iso structuralism*, polymorphism, *polytypism*, origin of twinning.

Spectroscopy methods :

IR spectroscopy in–situ spectroscopy, X-ray fluorescence analysis and X-ray diffraction patterns of various materials, Raman spectroscopy, moss-baur spectroscopy, nuclear magnetic resonance, DSC, DTA, TGA.

Microscopy :

Optical microscopy, electron microscopy, field ion microscopy, scanning electron microscopy, transmission electron microscopy, AFM.

Measurements of magnetic, dielectric, electric, piezoelectric, ferroelectric, poly-electric properties of materials

Books:

Crystallography and crystal structures by James M Dana
Material science and engineering by William D Callister,

Introduction to solids by Leonid V Azaroff, TMH publication,
Crystallography of solid state physics by Ajit Ram Verma and Om Srivastava Wiley Eastern Ltd.

AM 553 THERMODYNAMIC AND PHASE EQUILLIBRIUM

Concept of first, second and third law of thermodynamics, excess free energy, clapeyron equation, calculation of free energy as a function of pressure and temperature, construction of binary phase diagrams, entropy of mixing of ideal solid solution, concept of activity of a component (Aa) with respect to mole fraction (Xa) for ideal solution and for non ideal solution, construction of free energy of solid solution as a function of temperature and pressure, construction of solvus from free energy of mixing versus mole fraction data, calculation of Wg from symmetry solvus, calculation of graphite–diamond polymorphic transformation; determination of pressure and temperature of equilibration based on knowledge of free energy and activity data, Metallic Glasses.

Formation of Crystals, Crystal Growth (Theories Of Growth, Mechanism Of Growth, Growth in Solid State (Recrystallization, Martensite Transformation) Phase transformations, System, phase, component, phase rule, lever rule and free energy of phase mixture: single component system, binary systems, isomorphous system, equilibrium and non–equilibrium solidification, hume-rothery rules, free energy– composition diagrams, binary systems ($Fe-O_2$ system): a binary system with an intermediate phase showing incongruent melting behavior ($MgO-SiO_2$ system); a binary system with complete solid solution relationship (Fe–Ni system). A binary system with limited solid solution relationship having a eutectic system, the concept of solvus; calculation of temperature of equilibration from solvus, ternary system having two–end members forming solid solution, ternary system with end members having no solid solution relationship (relevant to refractory materials), ternary system with two components forming an intermediate compound, ternary system with the field of another intermediate compound having incongruent melting behaviour. The system FeO_2-SiO_2 -complex ternary and pseudo-ternary systems with examples relevant to material Scientists. Phase Transition (I order, II order. n++ order)

Books:
Thermodynamics and phase equilibrium by Dr. Alok Gupta and Chaterjee

AM-544 POLYMER SCIENCE AND ENGINEERING

History of evolution of materials, materials in common consideration, metals, ceramics and polymers, position of polymers in the material family, introduction of polymer, classification of polymer, structure-property relations copolymerization reaction, kinetics of polymerization reaction.

Plastics, rubber and fibers and their chemicals, thermal, mechanical and physical properties, characterization techniques, manufacturing processes, industrial applications, high performance engineering thermoplastic materials, smart polymers for cable industries, foundry and forge technology, telecommunication and information technology, advanced polymers for space application, tissues engineering etc., recent applications.

Polymer in environmental stability –degradation stability, environmental effects, radiation, and health hazardous effects, biodegradable polymers, effect of flame resistance and chemical resistance.

Some recent techniques of polymerization reactions: sol-gel techniques, nano-composites, nano-particles, nano-precipitations etc.

Special purpose polymers: expanding plastics, conducting plastics, foamed plastics, liquid crystal polymers, flat film sheet and laminations, photo curable polymers, biomedical polymers, polymers in electronic and IC's uses and as electrical insulations, high temperature polymer, organic super conductors, piezoelectric polymers (mechanism).

Books :
Polymer science by Gowariker , New age publications,
Polymer Science and Engg. By P. Ghosh, Tata McGraw Hill Publications.

AM-556 CERAMICS AND CERAMIC TECHNOLOGY

Introduction:

Types, nature, conventional and recent application, refractory, silicates, glasses, super-refractory etc.

Structure:

Types of bonding, bonding characteristics, ionic and super ionic conductivity, basic structure, structure of silicates, polymorphic transformations, ceramic oxides, perovskite structure, modeling constant crystalline and non crystalline ceramics.

Properties:

Mechanical, thermal, electrical, optical, magnetic, failure modes.

Phase equilibrium: one component system, silica, binary and ternary systems, miscibility gap in glasses, dilatometric expansion curve and viscosity based transition points in different kind of ceramics, diversification in glasses.

Processing:

Glass forming processes, drawing , hot and cold pressing , fibre forming, blowing, powder crushing, slip casting, hydro plastic forming, extrusion, centring, jiggering, sol-gel processing, anvil technologies, ceramic coating, fusion casting, dyeing and firing

Heat treatment of glasses:

Influence of processing and heat treatment on micro structure.

Special types and applications:

Toughened ceramics, cermets, piezoelectric ceramics, ceramic magnets, high temp. superconducting magnets, glass ceramic composites, chemically bonded ceramics, ceramics in electrical applications , electro ceramics, advanced ceramics.

Books:

Ceramic processing and sintering by M.N. Rahman , marcel bekker, inc.
Handbook of advanced ceramics vol.II, processing and their applications by shigeyuki somiya, Elscvyar Acadmic press.

AM-562 METALLURGY AND POWDER METALLURGY

Introduction to powder metallurgy and its brief historical background

Powder Characterization:

Sampling; particle size; measurement technique-Microscopy, screening, sedimentation, light scattering, electrical conductivity, X-ray techniques, comparison, particle size distribution, particle shape surface area analysis, profile analysis for shape inter-particle particle friction and its effects.

Powder fabrication:

Mechanical fabrication technique, electrolytic fabrication technique, chemical fabrication technique, atomization technique, microstructure control in powders, formation of specific metal powders;

Pre-compaction powder handling:

Mixing and blending approaches, friction in powder mass, mixing efficiency, powder lubrication, spray dying, and safety consideration.

Compaction:

Phenomenology of compaction, conventional compaction, theoretical basis, parametric relations, influence of powder characteristics, compaction technology.

Sintering:

Sintering theory pore structure, sintering diagram, mechanism, effect of compaction, sintering effects on properties mixed powder sintering, enhanced sintering. Sintering equipments full density processing (in brief)

Process metallurgy:

Extraction and refining of common non-ferrous metals such as aluminum, copper lead, zinc etc. iron and steel making laboratory exercise

Recent trends in Iron and Steel making:

Gas solid and slag-metal reactions: sponge iron making continuous steel making: continuous casting: vacuum degassing and electro slag re-melting: advances in agglomeration, blast furnace and steel making analysis of iron and steel making, analysis of iron and steel making processes and reactors: de-oxidation and impurity control: emphasis on application of physical chemistry and transport phenomena, corrosion fabrication process, testing, heat treatment, alloying.

(IInd SEMESTER) 2005-2006

AM-551 MECHANICAL BEHAVIOUR & FRACTURE MECHANICS

Mechanical Behavior of Materials:

Structure and Deformation in Materials, Mechanical Testing of Materials, Elastic Behaviour, Mechanisms, Stress and Strain relations and Analysis, Plastic Behavior, Mechanisms, Stress and Strain relations and Analysis, Time Dependent (Creep) and Anelastic Behavior, Mechanisms, Stress and Strain relations, Analysis and Applications in Design.

Fracture Mechanics:

Mechanisms of Fracture and crack growth, Elastic crack tip stress field, crack tip plastic zones, Stress intensity factor, Energy principles and criteria for crack growth, Plane strain and plane stress fracture toughness, Crack opening displacement criteria, Fatigue crack propagation under constant and variable amplitude loading, Crack closure, Effective stress intensity range, Concept of safe life, Fail safe and damage tolerance, Linear damage accumulation theory.

References:

- Materials Science and Engineering (6th edition) by William D.Callister; Wiley Eastern Publication.
- Mechanical Behavior of Material by Courtney Browne ,McGraw Hill
- Introduction to Fracture Mechanics David Brookes ,
- Fracture Mechanics by Prashant Kumar

AM-564 ELECTRICAL, ELECTRONIC AND MAGNETIC BEHAVIOUR OF MATERIALS

Introduction:

Conductors, semiconductors, dielectrics, superconductors, Insulators, their types and applications;

Electrical Properties:

High voltage conducting materials, High and low resistance materials; Contact fuse and filament materials, Conductors, cable & wire materials, Solder, sheathing and sealing materials, Electrical properties, Factors affecting electrical conductivity, Wiedemana-Franz law, Lorentz number, thermoelectric properties.

Electronic Properties:

Types of semiconductors, Semiconductor compounds and alloys and their properties; Structures of Semiconductor, Amorphous Semiconductor, Junction Properties Materials for different devices; Ruby laser, Semiconductor laser and other lasers etc; Optoelectronics LED materials, Liquid crystals (Types and functionality), Photo conductive materials, optical fiber etc; Dielectric Properties: Dielectric constant, Dielectric strength and dielectric loss; Polarizability, Mechanism of polarization, Behavior of polarization under impulse and frequency switching; Ferroelectrics, Piezoelectric, Pyroelectrics, Electrostriction effect. Types of dielectric materials, Clausius - Mosotti equation

Electro-optic ceramics:

Optical phenomena-birefringence, linear and quadratic electro-optic effects (Pockels and Kerr), Electro- optic coefficients, Materials - KDP, $LiNbo_3$, $LiTaO_3$, PLZT, Optimization of optical properties through processing, Applications in modulators, shutters, image storage, displays, etc[1]

Photonic materials:

Solar cells, photo-detectors, light emitting diodes, lasers and optical computers, Liquid Crystals (Types and Functionalities) Spintronics, Semiconductors (Optical Properties, Junction Properties, Structure of Semiconductors, Amorphous Semiconductors)[2]

Magnetic Properties:

Origin of magnetism, Basic terms and properties, Types of magnetic materials, Laws of magnetic materials, Domain theory, Domain growth & domain wall rotation, Magnetic anisotropy, Ferromagnetic domains, Magnetostriction & its mechanism; Ferrites, spinels & garnets; Hard and soft magnetic materials, Textured magnetic materials, Oxide magnetic materials, Magnetic tape, Magnetic bubble, Magnetic glasses, High energy hard magnetic materials, Recent developments.

Superconductivity:

Phenomenon, properties of superconductors, Meissner effect, Critical magnetic field & critical temperature; Types of superconducting materials, Type I & II superconductors, Silsbee rule, Mechanism of super conduction, BCS theory, Debye temperature, London's & Glag theories, High temperature ceramic superconductor applications: MRI, Maglev, MHDetc.

Smart Materials:

Magneto-rhelogical fluids, electro-rheological fluids shape memory alloy (SMA) (types and functionality), giant magneto resistance (GMR), colossal magneto-resistance (CMR)

Uses of smart materials systems in space auto mobile, civil engg. Structure vibration control, biology and medicine

AM-503 MECHANICS OF COMPOSITE MATERIALS

Introduction

Classification and characteristics of composite Materials, Mechanical behavior of composite materials, Basic terminology of laminated fiber-reinforced composite materials, Definitions of laminae and laminate; Brief introduction on manufacture and quality control of laminated fiber-reinforced composite materials, current and potential advantages of fiber-reinforced composite materials, Advantages in strength and stiffness, current and potential usage of composite materials, Application and Design aspect.

Mechanics of Composite Materials

Stress-strain relations for anisotropic materials, Engineering constants for orthotropic materials, Restriction on elastic constant, Stress-strain relations for plane stress in an orthotropic materials, Stress-strain relations for a lamina of arbitrary orientation, Invariant properties of an orthotropic lamina, Strength of an orthotropic lamina, Experimental Determination of strength and stiffness, Failure theories for lamina.

Classical lamination theory, special cases of Laminate stiffness, lay-of-out laminates and their types, strength of Laminates, Laminate Strength Analysis Procedure, Thermal and Mechanical stress Analysis, Concept of interlaminar stresses and Delamination;

References:

M. Jones,- Mechanics of Composite Material, McGraw Hill Publishing, New York, 1975.

S. W. Tsai, Composites Design, Think Composites, 1986.

B. D. Agrawal and L.J. Brountman, Analysis and Performance of Fiber Composite, Willey, New York, 1980.

Geoff Eckold, Design and Manufacture of Composite Structures, Wood -heed, Publishing Limited, Combridge, England, 1994.
Stephen W.Tsai and H. Thomas Hahn, 'Introduction to Composite Material", Technomic Publishing Company, Inc. Lancaster, 1980.
J. R. Vinson and T.W. Chou, "Composite Materials and their use in Structures", Applied Science Publishers Ltd., London, 1975.
M. M. Schwartz, Composite Materials Handbnook, McGraw Hill Book Company, New York, 1983.
J. N. Reddy and A.V. Krishna Moorty, "Composite Structures, Testing, Analysis and Design Narosa Publishing House, New Delhi. 1992.

Electives:

AM-563 NUCLEAR MATERIALS

Introduction:

Review of general properties of nucleus, packing fraction, mass defect, binding energy, nuclear forces, and nuclear models.

Radioactivity:

Natural radioactivity, nuclear structure and properties, radioactive disintegration series, decay, half life, nuclear reactions, artificial radioactivity, radiation detectors;

Nuclear fission and fusion:

Their mechanisms, fission and fusion energy, hazards, applications, Atom bomb, hydrogen bomb;

Nuclear power plant and their materials:

Nuclear reactor, pressurized reactor, breeder reactor; Materials for fuel, control rods, coolant, moderator, shielding;

Materials in nuclear related fields:

Materials for medicine-radio therapy, geological dating, carbon dating, medical diagnosis, industrial applications, agriculture, etc;

Effects of radiation on materials properties:

Effects ofα,β, γ rays on creep, fatigue, tensile, and other properties of metals, alloys, ceramics, polymers, rubbers etc. Effects on electrical, electronic and magnetic behavior of materials; Effects on crystal structure, grain size etc,.

AM-565 ADVANCED AND EMERGING MATERIALS FOR INDUSTRY

Introduction : Acquaintance with materials requirements of vast spectrum of industries. Superalloys. Cryogenic purpose materials. Creep, fatigue and corrosion resistant materials. Materials based on p-H value. High temperature materials. Futuristic materials. Wear resistant, high and low friction materials.
Materials for Different Industries such as automobile, aircraft, process industries, power plants, nuclear etc. Materials for rockets, missiles, satellites, space vehicles, heat exchangers, pressure vessels, pumps and valves, steam and gas turbines, boilers etc.
Materials for Non-Conventional Energy Sources such as for solar cells, fuel cells, biogas systems. Energy conversion and storage systems. Hydrogen energy and ocean energy systems.
Materials for Computer industry, nanotechnology needs, robotics, smart materials, viscoelastic materials, optical materials, materials for laser.
Advanced Materials : Metallic glasses, micro-alloyed steels, dual phase steels, maraging steels, hastealloys, duplex stainless steels, low density high strength (Al-Li) alloy, magnesium alloys, titanium alloys (Ti-aluminides) etc., Superalloys.
Advanced Techniques in Materials Technology : Rapid solidification, strengthening methods, dispersion hardening, whisker manufacturing etc.

AM-566 BIO-MEDICAL MATERIALS

Introduction : Various fields of applications such as biomedicals, biofertilizers, bio-energy, phermaceuticals, industrial wastes, toxicology, non-conventional and emerging areas.
Biomedical polymeric materials : Materials in medical and pharmaceutical applications such as vascular grafting, occulusive dressing, implants, medicated patches. Polymers such as nylon, segmented polyurethane, teflon, silastic rubber, siloxane, sulphone, hydrogels, protein etc. Materials for tissue culture, genetics, organ transplantation.
Biomedical engineering : Materials for spare parts for human body such as heart value, heart, veins, blood. Artificial limbs, teeth, eye etc. Their stress-strain analysis such as in walking, chewing, different kinds of motions.
Miscellaneous materials : Metals and alloys such as in bone joints. Ceramics such as in artificial teeth. plaster of paris, Composite : GRP, CRP etc.
Bioenergy purpose materials such as wood, ethanol from strach, biomass etc. Materials for gobar gas plant.
Biofertilizer materials such as silk, honey, wax lac, green manure, crop residue, etc.

AM-567 NANO-MATERIALS AND NANO-TECHNOLOGY:

Introduction to Solid State Physics

Introduction, Structure (Physics of solid state), Lattice Vibration, Energy Band, Energy Band, Localized Particles, Crystal Growth and Epitaxy (Czochralski Technique, Epitaxial Growth Technique, Chemical Vapor Deposition and Physical Vapor Deposition) Langmuir-Blodget growth.

Introduction to Methods of measuring Properties

Measurement Methods, Structure-Atomic, Crystallography, Particle Size, Surface Structures, Microscopy-TEM, FIM, SEM, Spectroscopy-Infra Red & Raman Effect, Photoemission, Magnetic Resonance

Properties of Nanoparticles

Properties of Nano-Particles, Metal Nano-Clusters, Semi conducting Nano-Particles, Rare Gas & Molecular Clusters, Methods of Synthesis Carbon Nano-Structures Carbon Nano- Structures, Carbon Molecule, Carbon Clusters, Carbon Nano- Tubes Applications of Carbon Nano-tubes Bulk Nano-Structured Materials Bulk Nano-structured materials, Solid Disordered Nanostructures, Nano-structured Crystals Lithography (optical lithography, electron beam lithography, extreme ultra violet lithography X-ray lithography, ion beam lithography) intercalation.

Etching (wet chemical etching, Si-etching Al etching. Ga-As etching, dry etching

Nanostructured, Ferromagnetism, Nanostructured, ferromagnetism, Optical & Vibrational Spectroscopy, Optical & Vibrational Spectroscopy, Infrared frequency range & Luminescence, Quantum Wells, Wires and Dots, Self Assembly and Catalysis, Self Assembly and Catalysis, Sol-gel processing (introduction, type of gel, metal alkoxide, a sol-gel process from metal alkoxide. sol-gel preparation technique application of sol-gel processing)

Organic Compound and Polymers

Forming & chatacterising Polymers, Nano-Crystalls, Polymers, Super Molecular Strectures

Biological Materials

Biological building blocks, Nucleic acids Biological Nano- structures Nano-Machines & Nano-Drives

Micro-electro mechanical system, Nano-electro mechanical system, Fabrication, Nano-devices and Nano-machines, Molecular & Super- Molecular Switches

References:

Introduction to Nanotechnology by Charles P. Poole and Frank J. Owens,Wiley Eastern Publications.

AM-514 COMPOSITE STRUCTURE

Governing equilibrium equations and Different possible boundary conditions for Bending, Buckling and Vibration of Laminated Plates. Solution techniques i.e. Series solution and Ritz method. Reissners Variational theorem and its application to static deformation of beams, Vibration of beams and Natural frequencies of simply supported beam, Mindlin Plate theory, shear deformation theories. Thermal and hygrothermal loadings.

References:

R. M. Jones,- Mechanics of Composite Material, McGraw Hill Publishing, New York, 1975.
S. W. Tsai, Composites Design, Think Composites, 1986.
B. D. Agrawal and L.J. Brountman, Analysis and Performance of Fiber Composite, Willey, New York, 1980.
Geoff Eckold, Design and Manufacture of Composite Structures, Wood -heed, Publishing Limited, Combridge, England, 1994.
Stephen W.Tsai and H. Thomas Hahn, 'Introduction to Composite Material", Technomic Publishing Company, Inc. Lancaster, 1980.
J. R. Vinson and T.W. Chou, "Composite Materials and their use in Structures", Applied Science Publishers Ltd., London, 1975.
M. M. Schwartz, Composite Materials Handbnook, McGraw Hill Book Company, New York, 1983.
J. N. Reddy and A.V. Krishna Moorty, "Composite Structures, Testing, Analysis and Design Narosa Publishing House, New Delhi., 1992.

AM-569 CORROSION AND OXIDATION

Introduction : Meaning of Corrosion and its types, Wet and dry corrosion, Porous and non-porous corrosion, Emf series of metals, Rate of corrosion under different environments, Passivity, Critical applications of corrosion.
Wet Corrosion : Galvanic Cell, Mechanism of galvanic cell, Types of galvanic cell corrosion, ion-concentration corrosion, Crevice corrosion, stress corrosion, water line corrosion.
Dry Corrosion : Mechanism, Protecting and non-protecting layers, Laws of corrosion, Examples..
Oxidation : Mechanism, Rate of oxidation, oxidation time, Free energy of oxide formation, Pilling-Bedworth ratio, Behaviour of oxide film.
Specific Types of Corrosion : Transcrystalline and Intergranular corrosion, Corrosion fatigue, Fretting corrosion, Cavitation-erosion corrosion, Caustic embrittlement, Hydrogen embrittlement, Dezincification, Season cracking, Pitting.
Factors Affecting Corrosion : Grain size, Vivid environments, Sea water, Radiation damage, Degradation of polymers.
Protection Against Corrosion : Noble metals, Corrosion and oxidation resistant materials, Effect of chromium, Inhibitors, Deairation of water, Cathodic protection,

Protective coatings : metallic and non-metallic, Appropriate design of components.
Case Studies : Corrosion in boilers petroleum pipelines, ships, food containers, offshore equipments etc. and their protection.

AM-508 FINITE ELEMENT METHODS

Introduction:

Basic concept of the Finite-Element method, variation formulation and approximation, variation Methods, Rayleigh-Ritz Method, Method of Weighted Residuals and Time Dependent Problems

Finite Element Analysis of One-Dimensional Problems:

Introductory Comments, one-dimensional second order equations, one dimensional fourth order equations, Approximation errors in the Finite Element Method, Isoparametric, Elements and Numerical integration;

Finite-Element Analysis of Two-Dimensional Problems:

Second-order equation involving a scalar valued function, Two-dimensional finite-elements and Interpolation functions, second-order multivariable equations, Plane elasticity problems;

Advanced Topics:

Eigenvalue Problems, Nonlinear problems, 3-D Problems.

References:

J. N. Reddy, An introduction to FEM, McGraw Hill, Publishing, 1985.
O.C. Zienkeiwicz and Margan, Finite Elements and Approximations, McGraw Hill Publications, 1983.
O.C. Zienkiwicz and R. L. Taylor, the Finite Element Method Vol.-I, McGraw Hill Publications, 1989.

O.C. Zienkiwicz and R.L. Taylor, the Finite Element Method Vol-II, McGraw HillPublications, 1989.

S.S.Rao, Finite Element Methods in Engineering, Pergamon Press, New York, 1989.

Open Elective BIOMEDICAL INSTRUMENTATION

(The open elective number 34 in the list of open electives as displayed on institute web site)

- **Introduction to Biomedical Instrumentation**: Sources of biomedical potentials. Different bioelectric signals like ECG, EMG & EEG.
- **Bio-potential electrodes**: Basic electrode theory, nearest equation, electrical conductivity of electrode jellies & creams, skin contact impedance & its measurement. Electrodes for ECG, EEE & EMG.
- **Cardiovascular system**: Physiology of heart & cardiovascular system, ECG lead configuration, ECG recorders, Vector cardiograph, Phonocardiograph, measurement of cardiac output, blood flow & blood pressure.
- **Central Nervous System**: Anatomy of nervous system, neuronal communication, neuronal receptors. The semantic & autonomic nervous system & spinal reflexes. Neuronal firing measurements, EEG measurements, Recorder for EEG & EMG.
- **Therapeutic equipments**: cardiac pacemakers, cardiac depibriliators, nerve & muscle stimulators, Diathermy, shortwave, uw & ultrasonic.
- **Medical Imaging System**: Instrumentation for diagnostics, X-Ray properties, X-ray units, X-ray machines & generation process, special imaging techniques for X-rays.
- **Ultrasonic Imaging System**: Physics of ultrasound, basic modes of transmission, ultrasonic display modes A scan, B scan & M scan with applications. Biological effects of ultrasound.
- **Electrical safety**: General consideration for biomedical recorder amplifiers, sources of noise in zero level recording circuits, physiological effects of electrical currents, electric shock hazards, leakage currents, methods of accident prevention. Test instruments for checking safety parameters of biomedical equipments.

REFERENCE BOOKS:

1) Handbook of Biomedical Instrumentation by R.S.Khandpur, TMH Pub.
2) Biomedical Instrumentation & Measurements by L.Cromwell, F.Weibell, E.A. Pfciffer, PHI Pub.
3) Introduction to Biomedical Equipment by Carr & Brown.
4) Medical Instrumentation by J.G.Webster, 3rd edition, John Wiley.
5) Biomedical Digital Signal Processing (Eastern Economy Education) by W.J.Tmpkins
6) Introduction to Biomedical Equipment Technology by Cass & Brown

Reference Journals

- IEE Colloquium on Biomedical Applications of Digital Signal Processing,
- IEEE Trans. On Biomedical Engineering,
- Journal of Biomedical Informatics

ANNEXURE-4

Ordinance and Course Structure
For
M.Tech. (Computer Science and Engineering)
M.Tech. (Software Engineering)
Full-Time and Part-Time Programs

1. Eligibility

(A) M.Tech. in Computer Science and Engineering (Full-Time)

The candidates having Bachelor's degree in Engineering in the branches of Computer Science and Engineering or Information Technology or Electronics and Communication Engineering or equivalent are eligible for admission to M.Tech. in Computer Science and Engineering. Further, candidates having M.Sc. (Computer Science) or Master of Computer Application are also eligible for the admission.

The candidates have to full-fill the additional academic requirements at the time of admission as specified by the department.

(B) M.Tech. in Computer Science and Engineering (Part-Time)

Eligibility qualification is as above in (A). In addition, the candidate must have two years of teaching experience.

(C) M.Tech. in Software Engineering (Full-Time)

The candidates having the Bachelor's degree in any branch of Engineering are eligible.

The candidates have to full-fill the minimum academic requirements at the time of admission as specified by the department.

(D) M.Tech. in Software Engineering (Part-Time)

Eligibility qualification is as above in (C). In addition, the candidate must have experience of two years in Industry/Institute.

2. Credit Hours Required

Credit hours and performance criterion are to be followed as given in Article 7.1 and 7.7 of PG Ordinances, Salient points of which are reproduced below :

(a) The minimum credit hours required for the award of the M.Tech degree is 64. Out of these minimum of 32 need to be credited through course work and 32 through the M.Tech. thesis work and seminar.
(b) These 64 credit hours may be earned through maximum of Six Semesters and minimum of Four Semesters.
(c) For Part Time Students 64 credit hours may be earned through maximum of Ten Semesters and minimum of Six Semesters.
(d) The preferred credit hours per semester are 16. However, a student can register for minimum of 8 credit hours and maximum of 20 credit hours.
(e) There is a provision of two semester leave in the duration of the M.Tech. program.

(f) The students have to maintain CPI (Cumulative Performance Index) of 6.0 (out of 10) and SPI (Semester Performance Index) of 5.5 (out of 10) in every semester to continue in the M.Tech. program.

3. Program Structure

(i) For Full-Time Program

Each semester is of 16 credits.
Each elective contains list of courses.
Each course in the elective list is of 4 credits.

(ii) For Part-Time Program

Each Semester is minimum of 8 credits.
Each elective contains list of courses.
Each course in the elective list is of 4 credits.

(A) M.Tech. (Computer Science and Engineering) Program (Full-Time)

Semester 1 :

S.No.	Course Title	Course Code	Credit
1.	Elective 1	See (Annexure - 1)	4
2.	Elective 2	See (Annexure - 1)	4
3.	Elective 3	See (Annexure - 1)	4
4.	Elective 4	See (Annexure - 1)	4

Semester 2 :

S.No.	Course Title	Course Code	Credit
1.	Elective 5	See (Annexure - 1)	4
2.	Elective 6	See (Annexure - 1)	4
3.	Elective 7	See (Annexure - 1)	4
4.	Elective 8	See (Annexure - 1)	4

Semester 3 :

S.No.	Course Title	Course Code	Credit
1.	Seminars on Computer Engineering	CS381	4
2.	Thesis-1	CS382	12

Semester 4 :

S.No.	Course Title	Course Code	Credit
1.	Thesis-2	CS481	16

(B) M.Tech. (Computer Science and Engineering) Program (Part-Time)

Semester 1 :

S.No.	Course Title	Course Code	Credit
1.	Elective 1	See (Annexure - 1)	4
2.	Elective 2	See (Annexure - 1)	4

Semester 2 :

S.No.	Course Title	Course Code	Credit
1.	Elective 5	See (Annexure - 1)	4
2.	Elective 6	See (Annexure - 1)	4

Semester 3 :

S.No.	Course Title	Course Code	Credit
1.	Elective 3	See (Annexure - 1)	4
2.	Elective 4	See (Annexure - 1)	4

Semester 4 :

S.No.	Course Title	Course Code	Credit
1.	Elective 7	See (Annexure - 1)	4
2.	Elective 8	See (Annexure - 1)	4

Semester 5 :

S.No.	Course Title	Course Code	Credit
1.	Seminars on Computer Engineering	CS381	4
2.	Thesis-1	CS382	12

Semester 6 :

S.No.	Course Title	Course Code	Credit
1.	Thesis-2	CS481	16

(C) M.Tech. (Software Engineering) Program (Full-Time)

Semester 1 :

S.No.	Course Title	Course Code	Credit
1.	Elective 1	See (Annexure - 1)	4
2.	Elective 2	See (Annexure - 1)	4
3.	Elective 3	See (Annexure - 1)	4
4.	Elective 4	See (Annexure - 1)	4

Semester 2 :

S.No.	Course Title	Course Code	Credit
1.	Elective 5	See (Annexure - 1)	4
2.	Elective 6	See (Annexure - 1)	4
3.	Elective 7	See (Annexure - 1)	4
4.	Elective 8	See (Annexure - 1)	4

Semester 3 :

S.No.	Course Title	Course Code	Credit
1.	Seminars on Software Processes	CS381	4
2.	Thesis-1	CS382	12

Semester 4 :

S.No.	Course Title	Course Code	Credit
1.	Thesis-2	CS481	16

(D) M.Tech. (Software Engineering) Program (Part-Time) including Teacher candidates of the Institute

Semester 1 :

S.No.	Course Title	Course Code	Credit
1.	Elective 1	See (Annexure - 1)	4
2.	Elective 2	See (Annexure - 1)	4

Semester 2 :

S.No.	Course Title	Course Code	Credit
1.	Elective 5	See (Annexure - 1)	4
2.	Elective 6	See (Annexure - 1)	4

Semester 3 :

S.No.	Course Title	Course Code	Credit
1.	Elective 3	See (Annexure - 1)	4
2.	Elective 4	See (Annexure - 1)	4

Semester 4 :

S.No.	Course Title	Course Code	Credit
1.	Elective 7	See (Annexure - 1)	4
2.	Elective 8	See (Annexure - 1)	4

Semester 5 :

S.No.	Course Title	Course Code	Credit
1.	Seminars on Software Processes	CS381	4
2.	Thesis-1	CS382	12

Semester 6 :

S.No.	Course Title	Course Code	Credit
1.	Thesis-2	CS481	16

Annexure - 1

List of Courses

Sl.No.	Course Code	Course Title	L	T	P	C
1	CS181	Foundation of Computer Science I	4	0	0	4
2	CS182	Foundation of Computer Science II	4	0	0	4
3	CS183	Software Engineering	3	0	2	4
4	CS184	Advance Computer Network	3	0	2	4
5	CS185	Advanced Computer Architecture	3	0	2	4
6	CS186	Advanced Software Engineering	3	0	2	4
7	CS187	Advance Algorithm Techniques	4	0	0	4
8	CS188	Advance Data Modeling	4	0	0	4
9	CS189	Multimedia Systems	3	0	2	4
10	CS190	Real Time and Embedded System	4	0	0	4
11	CS191	Network Security & Cryptography	3	0	2	4
12	CS192	Data Compression and Encryption	4	0	0	4
13	CS193	VLSI Design	4	0	0	4
14	CS194	Compiler Techniques	3	0	2	4
15	CS195	Oracle System Administration	2	0	4	4
16	CS196	Unix System Administration	2	0	4	4
17	CS197	Advanced Data Structure & File System	4	0	0	4
18	CS198	Advanced Database System	4	0	0	4
19	CS199	Genetic Algorithm & Neural Network	4	0	0	4
20	CS281	OO Analysis and Design	3	0	2	4
21	CS282	Functional Programming	3	0	2	4
22	CS283	Web Technology	3	0	2	4
23	CS284	Distributed Systems	3	0	2	4
24	CS285	Query and Transaction Processing	4	0	0	4
25	CS285	GIS	4	0	0	4
26	CS286	Electronic Commerce	3	0	2	4
27	CS287	Mobile Computing	4	0	0	4
28	CS288	Data Warehousing and Mining	4	0	0	4
29	CS289	Distributed Operating System	4	0	0	4
30	CS290	Parallel Computing	4	0	0	4
31	CS291	Network Programming	3	0	2	4
32	CS292	Current Trends in Imaging Systems	4	0	0	4
33	CS293	Fault Tolerant Computing	4	0	0	4
34	CS294	Linux Environment	2	0	4	4
35	CS295	Distributed Database System	4	0	0	4
36	CS296	Java Based Distributed Object Systems	3	0	2	4
37	CS297	Parallel Algorithm	4	0	0	4

Thesis & Seminar

Sl.No.	Course Code	Course Title	Credit
1.	CS381	Seminars on Computer Engineering	4
2.	CS382	Thesis-1	12
3.	CS481	Thesis-2	16

ANNEXURE- 5 (I)

Course Structure for M. Tech. Mechanical Engineering (Design)

S. No.	Code	Subject	L	T	P	Credit
First Semester						
1	MA-903	Advanced Mathematics	3	-	-	3
2	AM-901	Advanced Materials Science	3	-	-	3
3	ME-902	Computer Aided Design	3	-	-	3
4	ME-901	Finite Element Method	3	1	-	4
5	ME-904	Computer Programming	2	-	2	3

S. No.	Code	Subject	L	T	P	Credit
Second Semester						
1	ME-913	Design of Compressors	3	-	-	3
2	ME-914	Design of Thermal Systems	3	-	-	3
3	ME-915	Advanced Instrumentation and Process Control	3	-	-	3
4	ME-908	Optimazation Techniques	3	1	-	4
5		Elective-I	3	-	-	3

S. No.	Code	Subject	L	T	P	Credit
Third Semester						
1	ME-916	Dynamic Design of Mechanical System	3	-	-	3
2		Elective-II	3	-	-	3
3	ME-997	Seminar	-	-	-	2
4	ME-998	State of Art Seminar	-	-	-	2
5	ME-999	Thesis	-	-	-	6

S. No.	Code	Subject	L	T	P	Credit
Fourth Semester						
1	ME-999	Thesis	-	-	-	16

ANNEXURE- 5 (II)

COURSE STRUCTURE FOR M. TECH. MECHANICAL ENGINEERING (PRODUCTION)

S. No.	Code	Subject	L	T	P	Credit
First Semester						
1	MA-902	Statistical Methods in Engineering	3	-	-	3
2	AM-901	Advanced Materials Science	3	-	-	3
3	ME-901	Finite Element Method	3	1	-	4
4	ME-903	Computer Aided Manufacturing	3	-	-	3
5	ME-904	Computer Programming	2	-	2	3

S. No.	Code	Subject	L	T	P	Credit
Second Semester						
1	ME-910	Machining Science	3	-	-	3
2	ME-911	Metal Forming	3	-	-	3
3	ME-912	Production and Operation Management	3	-	-	3
4	ME-908	Optimazation Techniques	3	1	-	4
5		Elective-I	3	-	-	3

S. No.	Code	Subject	L	T	P	Credit
Third Semester						
1	ME-909	Robotics	3	-	-	3
2		Elective-II	3	-	-	3
3	ME-997	Seminar	-	-	-	2
4	ME-998	State of Art Seminar	-	-	-	2
5	ME-999	Thesis	-	-	-	6

S. No.	Code	Subject	L	T	P	Credit
Fourth Semester						
1	ME-999	Thesis	-	-	-	16

ANNEXURE- 5 (III)

Course Structure for M. Tech. Mechanical Engineering (Computer Aided Design and Manufacturing)

S. No.	Code	Subject	L	T	P	Credit
First Semester						
1	MA-901	Computational Mathematics	3	-	-	3
2	ME-901	Finite Element Method	3	1	-	4
3	ME-902	Computer Aided Design	3	-	-	3
4	ME-903	Computer Aided Manufacturing	3	-	-	3
5	ME-904	Computer Programming	2	-	2	3

S. No.	Code	Subject	L	T	P	Credit
Second Semester						
1	ME-905	Mechatronics	3	-	-	3
2	ME-906	Computer Integrated Manufacturing	3	-	-	3
3	ME-907	Business Database System	3	-	-	3
4	ME-908	Optimazation Techniques	3	1	-	4
5		Elective-I	3	-	-	3

S. No.	Code	Subject	L	T	P	Credit
Third Semester						
1	ME-909	Robotics	3	-	-	3
2		Elective-II	3	-	-	3
3	ME-997	Seminar	-	-	-	2
4	ME-998	State of Art Seminar	-	-	-	2
5	ME-999	Thesis	-	-	-	6

S. No.	Code	Subject	L	T	P	Credit
Fourth Semester						
1	ME-999	Thesis	-	-	-	16

ANNEXURE- 5 (IV)

List of Electives
For
M.Tech. (Common for all Specialization)

1.	ME-951	Rapid Prototyping and Manufacturing (Only for CAD/CAM/Production and Design)
2.	ME-952	Product Development (Only for CAD/CAM/Production and Design)
3.	ME-953	Reverse Engineering
4.	ME-954	Nanotechnology
5.	ME-955	Precision Engineering
6.	ME-956	Concurrent Engineering (Only for CAD/CAM/Production and Design)
7.	ME-957	Artificial Intelligence in Engineering
8.	ME-958	Evolutionary Algorithms
9.	ME-959	Systems Dynamics
10.	ME-960	Flexible Manufacturing Systems
11.	ME-961	Design Against Fatigue and Fracture
12.	ME-962	Noise and Vibration
13.	ME-963	Computer Graphics
14.	ME-964	Turbo Pumps Design
15.	ME-965	Design of Mechanical Systems
16.	ME-966	Tool Design
17.	ME-967	Logistics and Supply Chain Design
18.	ME-968	Machine Tool Dynamics
19.	ME-969	Advanced Welding Technology
20.	ME-970	Modeling and Simulation in Engineering
21.	ME-971	Total Quality Management
22.	ME-972	Ergonomics (Only for CAD-CAM/Production and Design)
23.	ME-973	Design for Manufacturing (Only for CAD-CAM/Production and Design)
24.	ME-974	Micro Electrical Mechanical Systems
25.	ME-975	Market Research and Forecasting
26.	ME-976	Management of Technology and Innovation
27.	ME-902	Computer Aided Design (Only for Production)
28.	ME-903	Computer Aided Manufacturing (Only for Design)
29.	ME-901	Finite Element Method (Only for Product Design and Development)
30.	ME-905	Mechatronics
31.	ME-906	Computer Integrated Manufacturing (Only for Design/Production and Product Design & Development)
32.	ME-909	Robotics (Only for Design and Product Design & Development)
33.	ME-920	Advanced Manufacturing Technology (Only for CAD-CAM/Design and Product Design & Development)

ANNEXURE-6

MOTILAL NEHRU NATIONAL INSTITUTE OF TECHNOLOGY ALLAHABAD

Amendments in Ordinances for M.C.A. Program in PG Manual

1. Introduction

The Department of Computer Science and Engineering offers a course named M.C.A. (Master in Computer Applications) for which the PG ordinances were adopted. However, there are remarkable differences in MCA and M.Tech./Ph.D. programmes. The curriculum of M.C.A. is closer to undergraduate rather than M.Tech./Ph.D. The qualifying criterion too is different for these programmes.

These facts were recognized by the Senate and Head CSED was directed to put a proposal for amendments of the PG Ordinances for its considerations. The relevant articles are listed below with proposed amendments.

2.3.3 M.C.A. Admissions

Candidates having B.Sc./B.C.A./M.Sc.(Integrated) or equivalent degree with Mathematics/Computer Science are eligible to apply. They must have secured not less than 60% (6 CGPA in scale of 10) marks in aggregate in graduation.

2.4 Admission Procedure

The applicants shall apply for admission on the prescribed forms available from Dean Academic office/ website of the institute. The duly completed application must be sent directly to the Head of the concerned department/ Programme.

1. All admissions shall be made only after approval of the Chairman, Senate on the recommendations of the duly constituted Departmental Selection Committees (DSC) and Chairman, SPGC. The DSC shall consist of at least four faculty members, at least one of whom shall be from another department. The constitution of the selection committee will be proposed by the DPGC and approved by Chairman, SPGC.
2. Departments shall constitute Selection Committees for one year starting from first of October every year for selection of the candidates, belonging to different categories, viz., Sponsored, Regular, QIP, etc.

3.(a) Admission to the M.Tech. programme may be made directly based on the GATE scores of the candidates and performance in the qualifying examination.

(b) Admission to the MCA programme may be made on the basis of combined entrance examination of national level (like NIMCET05) scores of the candidates and performance in the qualifying examination.

In addition to points 3(a) and 3(b) mentioned above. The candidates may also be called for written tests and/or interviews if the department so desires. The selection criteria shall be communicated to Dean (Academic Affairs) prior to issue of notification as laid down in section 2.2.2. .

4. Admission to the M.Tech. / Ph.D. programmes will be based on written tests and/or interviews of the candidates short-listed by the DSC.
5. The admission of Scheduled Castes/Scheduled Tribes candidates will be decided without comparing them with the general category candidates.

6. The selected candidate, who has completed all the examinations including project/thesis examination and the viva voce before the date of registration but is unable to produce the certificate in proof of having passed and secured the minimum specified qualifying marks, may be considered for provisional admission. However, if admitted provisionally, they will be required to produce the evidence of their having passed the qualifying degree examination with minimum specified period by the last date of registration, failing which the admission may be cancelled.
7. The provisions in para 6 above shall not be applicable in the case of MMS/ MBA_IBIT/MCA/M.Tech. / B.Tech. student of this institute, who have been provisionally selected for admission to a Ph.D. programme. These students will be admitted to the Ph.D. programme subject to the condition that they must successfully complete all the prescribed requirements including acceptance of their Thesis/Project in a particular semester by the last registration date as specified in the academic calendar.
8. On approval by the Chairman, Senate, the Head of the Department will issue the admission letters to the candidates, who will be required to accept the offer of admission by depositing the prescribed fee before the specified date.
9. In case a candidate does not accept the offer by paying the prescribed fee by the specified date, the offer of admission may stand withdrawn, and the admission may be offered to the candidates in the waiting list, if any, in order of merit.
10. The offer of admission may also stand withdrawn if the candidate who has accepted the offer fails to register by the date for last registration.

7.1. Minimum Residence, Maximum Duration and Academic Requirements

The following table lists the minimum residence and maximum duration allowed in the programme, and units requirements for graduation in the various programmes: "Course Work" includes only postgraduate course units unless otherwise stated. To satisfy the "Minimum Residence" requirements, registration must be over consecutive semesters; exception will be made only if the student is on authorized leave. "Maximum Duration" is counted from the student's first registration date. SPI/CPI will be calculated on the basis of all undergraduate and postgraduate courses taken by the student.

Programme	Minm Total Units	Minm. Units through course work	Minm. Units through Research	Minimum Residence Period (in Years)	Maximum Duration Full/(Part time) (in Years)	Remarks
M.Tech.	64	32	28	2 years (4 semesters)	Three Years/ (Five Years)	
MBA/ MMS	120	88	32	2 years (4 semesters)	Three Years (Five Years)	
MCA	***120***	***120***	***nil***	***3 years (6 semesters)***	***Five Years***	
Ph.D. with M.Tech.	80	8	56	2 years (4 semesters)	Five Years (Six Years)	
Ph.D. with B.Tech. /MCA	90	20	70	Three Years (6 semesters)	Five years (Seven Years)	
Ph.D. (with Management/ Science and Hum. with M.Sc/ MA/ M.Phil/ M.Com.	80	8	56	Two Years (4 semesters)	Five years (Seven Years)	

1. May include credit from one undergraduate course (permitted by the DPGC).
2. May register for undergraduate courses as a special case; these courses will be deemed to have zero units.
3. Excludes summer term.
4. Students in the External Registration Programme will be required to stay on the campus at least as long it takes to (i) complete the required course work and pass the comprehensive examination and (ii) get a written proposal (prepared in consultation with his/her supervisor and co-supervisor) outlining the work proposed to be done for his/her thesis.
5. Add an additional year in case of part-time/external students.

A department may prescribe, with prior approval of the SPGC, additional units of courses/thesis work, over and above the minimum specified in the above table.

7.5. Grades, Semester and Cumulative Performance Index

1. A student is awarded a letter grade in each course he/she is registered for, indicating his/her overall performance in that course. There are nine letter grades: A, B, C, D, E, F, S, X and I. The correspondence between grades and points (on a 10-point scale)/rating is given below:
   A: 10,
   B: 8
   C: 6
   D: 4
   E: 2
   F: 0
   S: Satisfactory
   X: Unsatisfactory
   I: Incomplete
2. If a student does not complete all the requirements for a course for a genuine reason, the instructor may award grade I (Incomplete). An I grade must be converted by the instructor to a regular letter grade by the last date for such conversion specified in the Academic Calendar, failing which it will automatically be converted to an appropriate grade at the time of compilation of the results.
3. A student getting an E or a F grade in a course must either repeat it or substitute it by another course as suggested by DPGC.
4. A student getting a D grade in a course may be allowed to repeat it or substitute it by another course, provided:
   i) His/Her CPI is less than the prescribed minimum and the student is allowed to continue in the programme (as per provisions of section 7.7), and
   ii) He/She has completed all the courses as prescribed by the department. In case a course is repeated or substituted only new grades will be accounted for calculation of SPI/CPI. All the courses attended by the student shall appear on the transcripts.
5. Seminars will be graded as satisfactory (S) or unsatisfactory (X) and will carry zero units for credit.
6. The grade S or X will be awarded for ***MCA Project***, M. Tech., and Ph.D. thesis units as follows: At the end of the semester, the thesis supervisor(s) (for M.Tech. and Ph.D. Thesis) and ***examination board*** (for MCA Project) will assess the student's progress towards the thesis and project work, respectively, during the semester and will award the grade S for each set of 4 units if the work is *satisfactory* and a X for every *unsatisfactory* 4 units. Thus a student registered for 16 units can get one of the following five combinations SSSS, SSSX, SSXX, SXXX, XXXX.
7. If a student is on leave for a part of the semester or submits his/her thesis in the middle of a semester, the SPGC may reduce his/her thesis/ project units appropriately.

7.7 Academic Performance Requirement

1. The minimum CPI requirement for continuing in the programme or for graduation is given below :

MCA Programme	***5.5***
M.Tech. Programme	6.0
Ph.D. Programme	6.5

2. In the first semester in which the student registers, the minimum CPI (SPI) may be relaxed by the SPGC as follows :

MCA Programme	***5.0***
M.Tech. Programme	5.5
Ph.D. Programme	6.0

3. If a student secures a CPI between the range as given below :

MCA Programme	***5.0 - 5.5***
M.Tech. Programme	5.5 - 6.0
Ph.D. Programme	6.0 - 6.5

then he/she may be allowed to continue in the next semester on the recommendation of the DPGC and with the approval of the SPGC. However these students shall complete all the other requirements at the time of passing out.

4.(a) A student is promoted to the next higher (Odd or Even) semester of MCA program only if both of the following conditions are met by him/her.

(i) He/She does not have E or F or X grade in any registered course or academic activities.

(ii) His/Her CPI is equal to or greater than 5.5

(b) A student who does not fulfill either or both of the above conditions is categorized as "Academically Deficient". The following guidelines and rules are applicable for such students.

(i) The Dean (Academic Affairs) and DPGC convener will advise the students regarding remedial actions to be undertaken to remove the academic deficiencies.

(ii) An academically deficient student shall be permitted to register with reduced workload consisting of appropriate number of courses in Odd/Even semester.

(iii) An academically deficient student shall be permitted to register for courses in which he/she has E or F or X grade, in either regular or summer semesters provided the courses are offered by the concerned departments.

(iv) The student shall be permitted to register for the courses in which they have D grade, only if, they are unable to meet the minimum requirements of CPI.

(v) An academically deficient student shall be allowed to register in the Fifth semester if and only if (a) he/she does not have E or F or X grade in first and second semester and (b) his/her CPI at the end of the first two semesters is equal to or greater than 5.5. The SPI/CPI are calculated after replacing the old grades by new grades obtained by them to remove academic deficiency. Further the academically deficient MCA students

who are registering for the summer semester (after fifth semester) are not allowed to go outside the campus for final semester projects. They shall be permitted to do their final semester project in the campus.

5. A student shall not be allowed to continue in the M.Tech. programme if

   (i) his/her CPI is below 5.5
   (ii) his/her CPI is below 6.0 in two consecutive semesters (however, SPGC may consider continuation as per provisions of Para 3).
   (iii) he/she obtains two Fs or two Es or one F and one E in the same semester.
   (iv) he/she accumulates four or more Xs towards thesis grades.

6. A student will normally not be allowed to continue in the Ph.D. programme if

   (i) his/her CPI is below 6.0
   (ii) his/her CPI is below 6.5 in two consecutive semesters (however, SPGC may consider continuation as per provisions of Para 3).
   (iii) he/she obtains two Fs or two Es or one F and one E in the same semester.
   (iv) he/she accumulates eight or more Xs towards thesis grades.
   (v) he/she accumulates six or more Xs towards thesis grades in two consecutive semesters.
   (vi) he/she secures Xs in all the thesis units registered for in two consecutive semesters.

7. HOD will issue a warning to a ***MCA***, M.Tech./Ph.D. student when he/she accumulates two or more Xs.

8. The DPGC will keep a watch on the progress of every student and whenever a student fails to meet the requirements, will intimate to the SPGC. If a student's programme is terminated, the Head of the Department will issue the letter of warning/termination.

9. If at the end of course work a
   (a) ***M.Tech.*** student secures a CPI between 5.5 and 6.0
   (b) Ph.D. student secures between 6.0 and 6.5 and
   (c) MCA student secures between 5.0 and 5.5
   he/she may be allowed to continue in the programme on the recommendations of the DPGC, SPGC and with the approval of the Senate. However these students if permitted by Senate to continue shall complete the CPI requirement at the time of passing out. In addition, they should not have a course with E or F grades.

11.1. (a) Appointment of Thesis Supervisors of M Tech. and Ph.D. Students

   (i) A student has to select a thesis supervisor within one month of successful completion of the Comprehensive examination if not done earlier.
   (ii) A student shall not normally have more than two supervisors at any given time.
   (iii) Thesis supervisor(s) of a student will normally be appointed from amongst the faculty members at MNNIT Allahabad using modalities decided by the departments.
   (iv) A student can have a co-supervisor from outside the institute on the recommendation of the DPGC and the SPGC and with approval of the Chairman, Senate.
   (v) The appointment or change of supervisor(s) will be communicated to the SPGC by the DPGC.
   (vi) In case there has been a change/addition in the supervisor(s), the M.Tech. thesis will not be submitted earlier than three months and the Ph.D. thesis will not be submitted earlier then six months from the date of such change.
   (vii) If a student's supervisor proceeds on long leave, then prior to proceeding on such a leave he/she shall, in consultation with HOD, the DPGC Convenor and the student, appoint a thesis coordinator for ensuring that the student does not suffer in his/her absence. Further if all research work and related analysis is complete except writing of the thesis, and the supervisor proposes to go on leave, the Thesis coordinator/Convenor DPGC shall take care of the

formalities, such as providing the list of examiners, conducting the oral examination, etc in consultation with the thesis supervisor(s).

(viii) In case a supervisor resigns/retires or otherwise ceases to be a faculty member of the institute and does not wish to continue as thesis supervisor the DPGC shall appoint a new supervisor or co-supervisor in consultation with the student.

(ix) Normally a faculty member shall not supervise more than four Ph.D candidates at any time and Five M.Tech. candidates. However the department may evolve a transparent policy for the distribution of M.Tech. students amongst the faculty members in the department.

(x) In case a faculty member is suspended / debarred for indulging in lowering the prestige of the institute in any manner he or she shall cease to be a thesis supervisor.

11.1. (b) Appointment of Project Supervisors of MCA Students

(i) MCA students (except academically deficient) are to undertake project in an industry in the sixth semester.

(ii) They shall select a supervisor from that industry.

(iii) The name of the supervisor, the industry and a brief outline of the project is to be communicated to the DPGC for its consideration.

(iv) Academically deficient students are required to work for their project in the Institute campus and accordingly the supervisor shall be from the Institute.

11.3.1. (a) M Tech Thesis Oral Examination Committee

1. The thesis will be examined by an oral examination committee formed by the thesis supervisor(s) in consultation with the DPGC Convener and recommended by the Head of the Department for approval of chairman SPGC.
2. The committee shall consist of the thesis supervisor(s), one faculty member from the department and one of the faculty members who should belong to a department/IDP, other than the student's department/IDP. The thesis supervisor will act as the Convener of the Committee.

11.3.1. (b) MCA Project Examination Committee

(i) The project of MCA student shall be evaluated by examination board constituted by DPGC.

(ii) The examination board shall consist of three to four faculty members of the Institute.

11.4.Submission of Thesis/Project

11.4.1. (a) M.Tech. Thesis

After the M.Tech. oral examination committee has been constituted, unbound copies of the thesis/project report one for each examiner of the oral board, prepared according to the format prescribed in the pamphlet entitled: Specification and Information Regarding the Preparation of Thesis, will be submitted at least a week before the probable date of oral examination. The DPGC shall arrange to send the copies of the thesis to the examiners. Two copies of the abstract (approximately 250 words) should also be submitted along with the thesis. After the final viva voce the modifications suggested if any, by the thesis board, may be incorporated and then submitted to the department.

11.4.1. (b) MCA Project Submission

After the completion of project, MCA student shall submit unbound copies of the project report, one for each examiner of the examination board, prepared according to the format specified by DPGC. The report will be submitted at-least a week before the date of examination.

ANNEXURE - 1 (Last 2 paragraphs)

Each department/interdisciplinary programme (approved by the Senate) shall have a Departmental Postgraduate Committee (DPGC) consisting of a Convener, the Head of the Department, Convenor DUGC and preferably four to six faculty members to be chosen from the Department, minimum of one faculty member from other department/interdisciplinary programme and two students, (one from the Ph D and other from the M. Tech. or ***MCA programme***). If M.Tech./***MCA programme*** does not exist both shall be from the Ph.D. programme. The student members shall be nominated for a period of one year. The DPGC Convener shall be nominated by the Head of Department in consultation with the faculty of the department for a term of two years. The duration of the committee shall be two years. The fifty percent of the initial members of the committee shall be replaced after one year.

The student members shall not participate when the cases of academic evaluation of individual students are being considered, although the students' opinion might be sought prior to taking any decision.

MOTILAL NEHRU NATIONAL INSTITUTE OF TECHNOLOGY,ALLAHABAD
Structure for B.Tech in CHEMICAL Engineering

SEMESTER-I						SEMESTER-II					
S.N.	Subject	L	T	P	Cr	S.N.	Subject	L	T	P	Cr
PH-101	Physics-I	3	1	3	5	PH-201	Physics-II	3	1	2	5
MA-101	Mathematics-I	3	1	0	4	MA-201	Mathematics-II	3	1	0	4
CS 101	Introduction to Engg. Profession	2	0	2	3	CS-201	Computer Programming	2	1	2	4
EX 101	Electrical & Electronics Engg.	4	0	2	5	HS 201/ CH 201	English Language and Composition/ Chemistry	2 3	1 1	1 2	3 5
HS 101/ CH 101	English Language and Composition/ Chemistry	2 3	1 1	1 2	3 5	AM-201	Engineering Mechanics	3	1	2	5
ME 101/ MC 101	Introduction to Manufacturing Processes/ Engineering Graphics	2 2	0 0	2 4	3 4	ME-201/ MC-201	Introduction to Manufacturing Processes/ Engineering Graphics	2 2	0 0	2 4	3 4
		16/17	3/3	10/13	23/26			15/16	5/5	9/12	24/27

SEMESTER-III						SEMESTER-IV					
S.N.	Subject	L	T	P	Cr	S.N.	Subject	L	T	P	Cr
MA-301	Mathematics-III	3	1	0	4	ME-401	Computational and Statistical Techniques	2	1	2	4
CE-301	Environment and Ecology	3	1	0	4	AM-404	Fluid Mechanics	3	1	2	5
AM-301	Material Science and Engineering	3	1	2	5	ChE-401	Mass Transfer Operation I	3	1	2	5
ChE-301	Chemical engineering Thermodynamics	3	1	2	5	ChE-402	Fuel Technology	2	1	0	3
AM-302	Strength of Materials	3	1	2	5	ChE-403	Heat Transfer Fundamentals and Operations	3	1	2	5
ME-302	Industrial Engineering	3	1	0	4	ChE-404	Chemical process calculations	3	1	0	4
		18	6	6	27			16	6	8	26

SEMESTER-V						SEMESTER-VI					
S.N.	Subject	L	T	P	Cr	S.N.	Subject	L	T	P	Cr
ChE-501	Mass Transfer Operation II	3	1	2	5	ChE-601	Chemical Technology II	3	1	2	5
ChE-502	Chemical Reaction Engg.I	3	1	2	5	ChE-602	Chemical Reaction Engg.II	3	1	2	5
HS-501	Principles of Mmt.	2	1	0	3	HS-602	Soft skill workshop	0	0	2	0
ChE-503	Measurement and Control	3	1	2	5	ChE-603	Heat Transfer Operations I	3	1	2	5
ChE-504	Chemical Technology I	3	1	2	5	ChE-604	Process equipment Design I	3	1	2	5
ChE-505	Chemical Process Industries	3	0	0	3	ChE-605	New Seperation Processes	3	1	0	4
						ChE-606	Materials in Chemical Industries	2	1	0	3
		17	5	8	27			17	6	10	27

SEMESTER-VII						SEMESTER-VIII					
S.N.	Subject	L	T	P	Cr	S.N.	Subject	L	T	P	Cr
ChE-701	Multiphase Transport Processes	3	1	0	4	ChE-601	Process Utilities	3	1	0	4
ChE-702	Heat Transfer operations - II	3	1	2	5	ChE-602	Elective – II	3	1	0	4
ChE-703	Process Equipment design – II	3	1	0	4	ChE-703	Elective – III	3	1	0	4
ChE-704	Elective – I	3	1	0	4	ChE-704	CAD of Chemical Plants	3	1	0	4
ChE-705	Project	0	0	16	8	ChE-705	Project	0	0	16	8
		12	4	18	25			12	4	16	24

MOTILAL NEHRU NATIONAL INSTITUTE OF TECHNOLOGY, ALLAHABAD

Course Structure for B.TECH. in PRINTING & MEDIA TECHNOLOGY

SEMESTER-I					
SUBJECT CODE	SUBJECT	L	T	P	Cr
PH-101	PHYSICS-I	3	1	3	5
MA-101	MATHEMATICS-I	3	1	0	4
CS-101	INTRODUCTION TO ENGINEERING PROFESSION	2	0	2	3
EX-101	ELECTRICAL & ELECTRONICS ENGINEERING	4	0	2	5
HS-101/ CH-101	ENGLISH LANGUAGE & COMPOSITION/ CHEMISTRY	2 3	1 1	1 2	3 5
ME-101/ MC-101	INTRODUCTION TO MANUFACTURING PROCESSES/ ENGINEERING GRAPHICS	2 2	0 0	2 4	3 4
		16/17	3/3	10/13	23/26

SEMESTER-II					
SUBJECT CODE	SUBJECT	L	T	P	Cr
PH-201	PHYSICS-II	3	1	2	5
MA-201	MATHEMATICS-II	3	1	0	4
CS-201	COMPUTER PROGRAMMING	2	1	2	4
HS-201/ CH-201	ENGLISH LANGUAGE AND COMPOSITION/ CHEMISTRY	2 3	1 1	1 2	3 5
AM-201	ENGINEERING MECHANICS	3	1	2	5
ME-201/ MC-201	INTRODUCTION TO MANUFACTURING PROCESSES/ ENGINEERING GRAPHICS	2 2	0 0	2 4	3 4
		15/16	5/5	9/12	24/27

SEMESTER-III					
SUBJECT CODE	SUBJECT	L	T	P	Cr
MA-301	MATHEMATICS-III	3	1	0	4
PM-301	OFFSET MACHINERY-I	3	1	2	5
PM-302	PRINTING MATERIAL SCIENCE	3	1	-	4
PM-303	PAPER & INK	3	1	-	4
PM-304	ELECTRONIC COMPOSITION & DTP	3	-	2	4
ME-302	INDUSTRIAL ENGINEERING	3	1	0	4
		18	5	4	25

SEMESTER-IV					
SUBJECT CODE	SUBJECT	L	T	P	Cr
EE-401	ELECTRICAL DERIVES & CONTROLS	3	-	2	4
PM-400	THEORY OF MACHINES	3	1	2	5
PM-401	REPROGRAPHIC ENGINEERING	3	1	0	4
PM-402	DESIGN & PLANNING FOR MEDIA PRODUCTION	3	1	0	4
PM-403	OFFSET MACHINERY-II	3	1	2	5
ME-404	PRODUCTION AND OPERATIONS MANAGEMENT	2	1	0	3
		17	5	6	25

Course Structure for B.TECH. in PRINTING & MEDIA TECHNOLOGY

SEMESTER-V					
SUBJECT CODE	SUBJECT	L	T	P	Cr
EX-501	DIGITAL SYSTEM & MICRO PROCESSORS	3	1	2	5
PM-501	SCREEN PRINTING & GRAVEURE	3	1	2	5
ME-501	MACHINE DESIGN	3	1	2	5
PM-502	FLEXOGRAPHY	3	-	2	4
PM-503	NON IMPART PRINTING	3	1	0	4
PM-504	PRINTING IMAGE GENERATION	3	-	2	4
		18	4	10	27

SEMESTER-VI					
SUBJECT CODE	SUBJECT	L	T	P	Cr
CS-601	COMPUTER GRAPHICS & IMAGE PROCESSING	3	1	2	5
PM-601	PACKAGING TECHNOLOGY	3	1	2	5
PM-602	INSTRUMENTATION & CONTROL FOR GAI	3	1	2	5
PM-603	TONE & COLOR ANALYSIS	3	-	2	4
PM-604	PRINT FINISHING & CONVERTING	3	1	-	4
PM-605	INTERACTIVE MULTIMEDIA	3	-	2	4
		18	4	10	27

SEMESTER-VII					
SUBJECT CODE	SUBJECT	L	T	P	Cr
PM-701	WEB PUBLISHING & MARKETING	3	1	2	5
OE-701	OPEN ELECTIVE-I	3	1	-	4
PM-702	PROFESSIONAL ELECTIVE-I	3	1	-	4
PM-703	PROFESSIONAL ELECTIVE-II	3	1	-	4
PM-704	PROJECT	-	-	16	8
		12	4	18	25

SEMESTER-VIII					
SUBJECT CODE	SUBJECT	L	T	P	Cr
PM-801	MANAGEMENT ENGINEERING	3	1	2	5
OE-801	OPEN ELECTIVE-II	3	1	-	4
PM-803	PROFESSIONAL ELECTIVE-III	3	1	-	4
PM-804	PROFESSIONAL ELECTIVE-IV	3	1	-	4
PM-805	PROJECT	-	-	16	8
		12	4	18	25

Course Structure for B.TECH. in PRINTING & MEDIA TECHNOLOGY

List Of Professional Electives

GROUP-1

1. Computer Aided Publishing
2. Advertising Theory & Practice
3. CAD/CAM in Printing

GROUP-2

1. Total Quality Management in GAI
2. Print Management Costing & Estimating
3. Production Planning & Control

GROUP-3

1. Media Ethics & Managing Media Elements
2. Planning & Print Estimating
3. On Demand Printing

GROUP-4

1. Printing Plant Layout Facility Design
2. Publishing Science
3. News Paper Technology
4. Electronic Paper