NATIONAL INSTITUTE OF TECHNOLOGY
(DEEMED UNIVERSITY)
KURUKSHETRA

AGENDA
OF
SENATE

8th MEETING
TO BE HELD ON   20th OCTOBER, 2006

NATIONAL INSTITUTE OF TECHNOLOGY
(DEEMED UNIVERSITY)
KURUKSHETRA-136119

Agenda	:	8th Meeting of the Senate
Venue	:	Senate Hall, NIT, Kurukshetra
Date & Time	:	20th October, 2006 at 11.30 AM

Item No.	Agenda Item	Pages
8.1	To confirm the minutes of the 7th meeting of the Senate held on 09.06.2006.	1- 22
8.2	To note the action taken on the minutes of the 7th meeting of the Senate held on 9.6.2006.	23 – 25
8.3	To consider report submitted by the Committee constituted by the Senate regarding consolidation of the information to be enshrined in the Ordinance of Studies for the Degree of philosophy (Ph.D.) of our Institute (Ref. Item 5.17 and 7.7	26
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8.6	To note the creation of Department of Business Administration and admissions made to the Masters in Business Administration Course for the session 2006-2007 at NIT, Kurukshetra.	30
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8.11	To Consider Scheme and Syllabi of M.Tech. in CAD/CAM and Robotics & Automation (Mechanical Engineering).	45 – 47

NATIONAL INSTITUTE OF TECHNOLOGY
(DEEMED UNIVERSITY)
KURUKSHETRA-136119

Tabled Agenda	:	8th Meeting of the Senate
Venue	:	Senate Hall, NIT, Kurukshetra
Date & Time	:	20th October, 2006 at 11.30 AM

Item 8.1 To confirm the minutes of the 7th meeting of the Senate held on 09.06.2006.

The minutes of the 7th meeting of the Senate held on 09.06.2006 were circulated to all the members. The minutes are enclosed as **Appendix-1** from **pages 3 to 22.**

Dr. A.K.Gupta, Professor, ECE Department has offered comments on item No. 7.07 – R3.1(i)-(b) and (c) which are reproduced below:

Item	Minutes approved by the Senate	Comments offered by Dr. A.K. Gupta
To consider the eligibility for admission to Ph.D. Programme, Scholarships, changes in the 'Panel of Examiners' for evaluation of Ph.D. thesis and Ordinance of Ph.D. (Ref. Item 5.15, 5.16 & 5.17).	**Educational Qualifications:** An applicant possessing any of the following qualifications shall be eligible for admission to a Ph.D. Programme of the Institute. i) Engineering Stream:- (a) .... (b) Bachelor's degree (B.Tech./B.E.) in appropriate discipline, or equivalent, with a minimum of 90% marks in aggregate (of all the years/ semesters of the course), or equivalent CGPA. Such a candidate has to compulsorily clear at least four theory courses of M. Tech. in relevant discipline, as decided by the DRC.	**R 3.1-(i)-(b):** As per proposed amendment, B.Tech. with minimum 90% marks shall be eligible for admission to Ph.D. This percentage is too high to be practical. In most of the institutions where credit based system is followed, 90% marks are equivalent to securing 'A' grades in all the subjects studied by the student in 4-year B.Tech. programme. This is certainly very rare. Many otherwise suitable students will have to be declared non-eligible if the condition of minimum of 90% marks is enforced. A more reasonable threshold would be somewhere in the range of 80% to 85%.

	(c) Bachelor's degree (B.Tech./B.E.) in appropriate discipline, or equivalent, with a minimum of 70% marks in aggregate (of all the years/ semesters of the course),or equivalent CGPA, and a minimum of 15 years of regular service in Govt. Organizations or teaching Institutes of degree level.	**R 3.1-(i)-(c)** I feel that for the candidates with experience, there should be less emphasis on percentage marks in B.Tech. and more emphasis on the candidates suitability for research programme as evidenced by his/her research publications. Accordingly I propose the following eligibility conditions under this clause:- 1. B.Tech. with First Division AND 2. One research paper in a refereed international journal OR two research papers in refereed Indian journal AND 3. Minimum 5 years experience in R&D section of an industry OR teaching experience in an approved Institution.

The Senate may confirm the minutes of the 7th meeting of the Senate after considering the above comments offered by Dr. A.K. Gupta.

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NATIONAL INSTITUTE OF TECHNOLOGY
(DEEMED UNIVERSITY)
KURUKSHETRA-136119

Minutes of the 7th Meeting of Senate, National Institute of Technology, Kurukshetra, held on 9th June, 2006 at 11.00 AM in the Senate Hall of the Institute.

The following were present:

Members present:

1. Dr. M. N. Bandyopadhyay
   Director,
   NIT, Kurukshetra.

   In Chair

2. Prof. C.V. Ramakrishnan
   Professor,
   Department of Applied Mechanics,
   Indian Institute of Technology,
   New Delhi-110016.

3. Sh. Ravi Jaidka
   President,
   Indian Sugar & Gen. Engg. Corporation,
   Yamuna Nagar, Haryana

4. Shri S.P.Malti
   Chief Engineer-II
   Konkan Railway Corp Ltd.,
   Jyotipuram Road, Tirantha,
   Post Grum More, Riyasi,
   Distt. Udhampur Pin 182 311
   Jammu & Kashmir

5. Dr. Krishna Gopal
   Professor, Elect. Engg. Deptt.
   and Dean (Planning & Development),
   NIT, Kurukshetra.

6. Dr. R.K. Bansal
   Professor,
   Civil Engineering Department
   NIT, Kurukshetra.

7. Dr. T. K. Garg
   Professor, Mech. Engg. Deptt.,
   and PTSW,
   NIT, Kurukshetra.

8. Dr. M. K. Soni
   Professor,
   Electrical Engineering Department,
   & Dean (Estate, Consin. & Elect. Mtc.)
   NIT, Kurukshetra

9. Dr. S. P. Jain
   Professor,
   Electrical Engineering Department,
   NIT, Kurukshetra.

10. Dr. V. K. Aroni,
    Professor,
    Civil Engineering Department,
    NIT, Kurukshetra.

11. Dr. V. K. Sehgal
    Professor & Chairman,
    Civil Engineering Department,
    NIT, Kurukshetra.

12. Dr. S. K. Sharma
    Professor & Chairman,
    Mechanical Engineering Department,
    NIT, Kurukshetra.

13. Dr. K. C. Goyal
    Professor,
    Mechanical Engineering Department,
    NIT, Kurukshetra.

14. Dr. A. K. Gupta
    Professor,
    Electronics & Comm. Engg. Deptt.,
    NIT, Kurukshetra.

15. Dr. K. S. Kasana
    Professor,
    Mechanical Engineering Department,
    & Dean (Academic),
    NIT, Kurukshetra.

16. Dr. K. B. Singh
    Professor,
    Department of Humanities & Social Sciences,
    NIT, Kurukshetra.

17. Dr. S. K. Chakarvarti
    Professor & Chairman,
    Physics Department
    NIT, Kurukshetra.

18. Dr. D. V. Singh
    Professor & Chairman,
    Mathematics Department,
    NIT, Kurukshetra

19. Dr. D.K .Soni,
    Professor,
    Civil Engineering Department,
    NIT, Kurukshetra.

20. Dr. R. C. Bhattacharjee,
    Professor,
    Civil Engineering Department,
    NIT, Kurukshetra.

21. Dr. M. L. Garg
    Professor,
    Mathematics Department,
    NIT, Kurukshetra

22. Dr. N. K. Gupta
    Professor,
    Civil Engineering Department,
    NIT, Kurukshetra

23. Dr. S. S. Rattan
    Professor & COE,
    Mechanical Engineering Department,
    NIT, Kurukshetra

24. Dr. K. S. Sandhu
    Professor,
    Electrical Engineering Department,
    NIT, Kurukshetra.

25. Dr. Sudhir Kumar
Professor,
Mechanical Engineering Department,
NIT, Kurukshetra.

26. Dr. Baldev Setia
Professor,
Civil Engineering Department,
& Professor-in-Charge (Academic Affairs),
NIT, Kurukshetra

27. Dr. Rajender Kumar
Professor & Chairman,
Department of Humanities and Social Sciences,
NIT, Kurukshetra

28. Dr. Brahamjit Singh
Professor & Chairman,
Electronics & Comm. Engg. Department,
NIT, Kurukshetra

29. Dr. Dinesh Kumar
Assistant Professor & Chairman,
Chemistry Department,
NIT, Kurukshetra.

30. Prof. Mayank Dave
Asstt. Professor & Chairman,
Computer Engineering Department,
NIT, Kurukshetra.

31. Sh. R. P. S. Lohchab
Registrar & Member Secretary (Senate)
NIT Kurukshetra

The following members could not attend the meeting:-

1. Dr.(Mrs.) Renu Bhargava
Professor,
Civil Engineering Department
Indian Institute of Technology,
Roorkee (UA).

2.   Dr. R. L.Sharma,
Professor,
Civil Engineering Department,
National Institute of Technology,
Hamirpur (HP).

3.   Dr. M. L.Kothari,
Professor,
Electrical Engineering Department,
Indian Institute of Technology,
Hauz Khas,
New Delhi-110016

4.   Er. Mukesh Gulati
Sr. Cluster Development Adviser,
United Nations Industrial Development Organization,
USO House, USO Road,
6 Special Institutional Area,
New Delhi-110067.

5.   Shri Adesh Gupta
Chief Executive Officer,
Liberty Group of Industries,
Karnal

6.   Dr. Ranjit Singh
Director,
Netaji Subhash Institute of Technology,
Azad Hind Fauj Marg,
Sector-3, Dwarka,
New Delhi

7.   Dr. A. Swarup,
Professor,
Electrical Engineering Department,
NIT, Kurukshetra

8   Dr. Kuldeep Kumar
Professor and Chief Warden
Mathematics department,
NIT, Kurukshetra.

At the onset, before the Agenda items were taken up for discussion, the Registrar and Member-Secretary welcomed the members of the 7th Meeting of the Senate, especially the new members, namely Dr. D. K. Soni, Dr. R. C. Bhattacharjee, Dr. N. K. Gupta, Dr. Baldev Setia, and Sh. S. P.Mahi.

Item No. 7.01   To note the nomination of external members of the Senate.

The Senate noted the nomination of the following external members of the Senate for the period from 18.05.2006 to 31.08.2008.

For the category of 3 Members from amongst educationists:

New nomination for membership of the Senate.	In place of :
Dr. R.L. Sharma, Professor in Civil .Engineering National Institute of Technology, Hamirpur (HP)	Dr. M. P. Kapoor Y-8A, 1st Floor Hauz Khas, New Delhi. 110 016

For the category of 6 members for their special knowledge:

New nomination for membership of the Senate	In place of:
Dr. M.L. Kothari, Professor Electrical Engineering Department Indian Institute of Technology, Hauz Khas New Delhi. 110 016	Prof. Sameresh Kar (Retd. Professor, IIT Kanpur) House No. 501, IIT Campus Kanpur – 208016 (UP)
Shri S.P.Mahi Chief Engineer-II Konkan Railway Corp Ltd., Jyotipuram Road, Tirmilha, Post Gram More, Riyasi, Distt. Udhampur (J & K)- Pin 182 311	Shri V.K.Sachdeva, Executive Director, The Saraswati Sugar Mills, Yamuna Nagar-135001 (Haryana)
Er. Mukesh Gulati Sr. Cluster Development Adviser, United Nations Industrial Development Organization, USO House, USO Road, 6 Special Institutional Area, New Delhi-110067.	Shri K.R.Sharma, (Former Professor and Head, Electrical Engg. Department, IIT, Kanpur Vice-President, Samtel Colour Ltd., Ghaziabad (UP)
Shri Adesh Gupta Chief Executive Officer Liberty Group of Industries KARNAL.	Shri V.K. Raizada, Former Member Railway Board Managing Director, IRWO 58, Rail Vihar, Sector 15 NOIDA
Dr. Ranjit Singh Director Netaji Subhash Institute of Technology Azad Hind Fauz Marg, Sector 3, Dwarka New Delhi.	Dr. A.K. Bhatnagar Petrotech Chair Professor Department of Chemical Engg. Indian Institute of Technology Hauz Khas, New Delhi. 110 016

Item No. 7.02 To confirm the minutes of the 5th Meeting of the Senate held on 14.01.2006.

The minutes of the 5th meeting of the Senate had been circulated to all the members. Only one observation in constitution of a committee was received and the same was incorporated.

The minutes were confirmed.

Item No. 7.03 To confirm the minutes of the 6th meeting of the Senate held on 16.03.2006.

The minutes of the 6th meeting of the Senate held on 16.03.2006 had been circulated to all the members. No observations were received from the members.

The minutes were confirmed.

Item No. 7.04 To consider the Action Taken Report on the minutes of the 5th Meeting of the Senate held on 14.01.2006.

The action taken report of 5th meeting was placed before the Senate.

Regarding item No. 5.23 (i) the Chairmen of Electronics and Communication Engineering and Computer Engineering Departments were asked to introduce the course on Information Security Awareness at the B. Tech. and M. Tech. levels. It was reported that the Electrical Engineering Department had already introduced this course at the appropriate levels.

Corresponding to item No. 5.23 (ii), it was decided that since the matter regarding honorarium etc. involves considerable financial implication, it requires consideration at the level of the Director and other higher authorities.

Item No. 7.05 To consider the Action Taken Report on the minutes of the 6th Meeting of the Senate held on 05.02.2006.

The action taken report was placed before the Senate. It was noted by the Senate.

Item No. 7.06 To report the Agenda and Minutes of 2nd and 3rd meetings of SCSA.

The Senate was informed that so far 3 meetings of SCSA had been held respectively on 21.02.2006, 22.03.2006 and 1.05.2006. The minutes of the 1st meeting had been presented before the Senate in its 6th meeting. The minutes of 2nd and 3rd Meetings as detailed in the Agenda were placed before the Senate and approved except the item regarding relaxation of attendance of 7th and 8th

semesters. After deliberations, it was decided to constitute a committee of all Deans and Chairmen of the Departments to look into this item. Dean (Academic) was asked to coordinate this committee and in light of urgent nature of the problem, to submitted an early report.

Item No. 7.07 To consider the eligibility for admission to Ph.D. Programme, Scholarships, changes in the 'Panel of Examiners' for evaluation of Ph.D. thesis and Ordinance of Ph.D. (Ref. Item 5.15, 5.16 & 5.17).

The report submitted by the committee comprising of Dr. S. P. Jain Chairman, Dr. K. S. Kasana Member, Dr. S. K. Chakarvarti Member and Dr. Baldev Setia, Special Invitee was placed before the Senate for its consideration and discussion.

Regarding Item No. 5.15 :

The Senate discussed the report which after minor amendments reads as follows:

	Existing		Proposed Amendment
1.	R3.1. Educational Qualifications: An applicant possessing the following qualifications in appropriate areas shall be eligible to apply for admission for Ph.D. Programmes of the Institute. Master's degree in an appropriate discipline or equivalent with a minimum Cumulative Grade Point Average (CGPA) of 6.75 on a 10 point scale or equivalent as determined by the Institute wherever Letter Grades are awarded; or 60% marks in aggregate (of all the years/semesters) where marks are awarded.	1.	R-3.1 Educational Qualifications: An applicant possessing any of the following qualifications shall be eligible for admission to a Ph.D. Programme of the Institute. i) Engineering Stream: (a) Master's degree (M.Tech/M.E/ M.S.) preceded by a Bachelor Degree in Engg/Tech in appropriate discipline, or equivalent, with a minimum of 65% marks in aggregate (of all the years/semesters of the course), or equivalent CGPA. (b) Bachelor's degree (B.Tech./B.E.) in appropriate discipline, or equivalent, with a minimum of 90% marks in aggregate (of all the years/ semesters of the course), or

			equivalent CGPA. Such a candidate has to compulsorily clear at least four theory courses of M. Tech. in relevant discipline, as decided by the DRC.

(c) Bachelor's degree (B.Tech./B.E.) in appropriate discipline, or equivalent, with a minimum of 70% marks in aggregate (of all the years/ semesters of the course),or equivalent CGPA, and a minimum of 15 years of regular service in Govt. Organizations or teaching Institutes of degree level.

ii)Sciences/Mathematics Stream:

(a) Master degree (M.Sc./M.A.) in the appropriate discipline, or equivalent, with a minimum of 65% marks in aggregate (of all the years/semesters of the course), or equivalent CGPA.

(b) Humanities & Social Sciences Stream:

Master degree (M.A.) in the appropriate discipline, or equivalent, with a minimum of 60% marks in aggregate (of all the years/semesters of the course), or equivalent CGPA. |
| 2. | Scholarship:

Only the candidates passing through Graduate Aptitude Tests in Engineering (GATE) are eligible for Government scholarship.

In 2002, the MHRD has raised the scholarship amount to Rs.7,000/- per month for M. Tech. Degree | 2. | Eligibility for Institute Scholarship:

Only full-time Ph.D. research scholars are eligible for the award of the Institute scholarship.

A candidate/scholar is required to apply for scholarship. In a particular department, |

holders and Rs.6,000/- per month for B. Tech./ M. Sc. Degree holders, with increment of Rs.500/- per annum. There shall be a contingency grant of Rs.10,000/- per annum. Ph.D. Scholars should do around 8 to10 hours of teaching per week.

scholarships will be awarded only if these are available in that department.

(a) In Engineering Stream, scholarship to those scholars who have a Master's degree will be awarded first to GATE-qualified scholars on the basis of the GATE score merit list, then to the non-GATE scholars on the basis of their Master's degree score merit list.

(b) Scholarship to those scholars who are only B.Tech/B.E. or equivalent, will be awarded first to such scholars who have a valid GATE score card.

(c) In Sciences/ Mathematics, and Humanities & Social Sciences Streams, only those scholars who are M. Phil., or have cleared relevant national level tests like NET conducted by UGC, CSIR, ICAR and possess a valid score card, are eligible. However, preference will be given first to M.Phil. scholars.

(d) In case no eligible candidate as defined above is available for the award of the scholarship, the Director, on the recommendation of the Chairman of the concerned Deptt. and the DAC may award the scholarship to the scholars at his discretion.

The scholarship amount* will be as under-

M.Tech/M.E/M.S. or quivalent, and M.Phil: Rs 9,500/- p.m.

OnlyB.Tech/B.E, or equivalent,

and only M.A./M.Sc., or equivalent : Rs.8,000/- p.m.

There shall be an annual increment of Rs 1,000/-.

An annual contingency grant of Rs.10,000/-per fulltime scholar, and of Rs.10,000/- per part-time scholar will be allocated to the concerned Department.

*Subject to the approval of MHRD.

Those who are awarded scholarship from any other source will not be eligible for Institute scholarship.

The scholarship can be awarded for at the most three years with a scope for extension for one year with the approval of the Director on recommendation of DRC and BOS of the Department.

In case the semester research progress is unsatisfactory, the scholarship/scholarship shall be discontinued.

A Ph.D. research scholar receiving scholarship is required to devote at least eight hours per week towards the departmental or Institute work assigned to him/her by the Chairman/Director.

The above rules will be implemented w.e.f. 2006-07 admissions.

| 3. | Last date of submission of application is 31st August and 31st January | 3. | Last date of submission of application is 31st May and 30th November of every calendar year. |

Regarding Item No.5.16:

To consider changes in the 'Panel of Examiners' for evaluation of Ph.D. thesis.

Existing (Ordinance and Regulations for the Degree of Doctor of Philosophy, NIT, Kurukshetra)	Proposed modification
R. 11.3 Panel of Examiners:	**R. 11.3 Panel of Examiners:**
A panel of at least ten external experts in the area of the Ph. D. thesis would be suggested by the Supervisor(s) and recommended by the DRC while forwarding the title and synopsis of the thesis. The panel so recommended may include the examiners from outside India. The recommended panel will be considered and approved by BOS.	A penal of at least ten external experts, including foreign experts, and the authors of the recent papers in the references cited by the scholar in the area of his Ph. D. work would be suggested to the DRC by the Supervisor(s). The DRC will consider the suggested panel and will finally recommend to the BOS a panel of ten examiners which will include at least three examiners from outside India, from advanced/developed countries and the rest from India from the Institutes of repute. The recommended panel will be considered and approved modified by BOS.
R. 12 Board of Examiners:	**R. 12 Board of Examiners:**
On receipt of the title and synopsis of the thesis, the Director will appoint a Board of Examiners for each candidate from the list approved by the BOS. The Board will consist of one internal examiner, normally the Supervisor as recommended by DRC & BOS and two external examiners, who shall be experts in the subject of the thesis. These external examiners shall be chosen normally form the panel of examiners recommended and approved by the DRC and BOS as aforesaid. A person working in the same laboratory (ies)/ Institution(s) where Research Candidate is employed cannot, however, be appointed as External	On receipt of the title and synopsis of the thesis, the Director will appoint a Board, of Examiners for each candidate from the list approved by the BOS. The Board of examiners will consist of one internal examiner, normally the supervisor as recommended by DRC, and two external examiners, out of which one would be from within India, and the other from abroad. These external examiners shall be chosen normally from the panel of examiners recommended by the BOS as aforesaid. A person working in the same Orgnization(s)/Institute(s) where the research scholar is employed cannot, however, be appointed as External Examiner for that research scholar. Further, no person can be appointed as External Examiner from an

Examiner for evaluating the Thesis of that Research Candidate. Further no person can be appointed as External Examiner from Laboratory/Institution to which the Co-Supervisor (s) of the Research candidate belongs.	Organization/Institute to which the Co-Supervisor (s) of the research scholar belongs.
	For evaluating the thesis, the Indian external examiner will be paid at the rate of Rs 2,000/-per thesis; and the foreign external examiner shall be paid at the rate of US$200. The viva-voce examination of the scholar will be given by the Indian examiner, who will be paid an additional honorarium of Rs 1,000/-.
	An examiner will be reimbursed TA/DA as per the Institute (NITK) rules. He will also be reimbursed all associated correspondence expenses incurred by him for the purpose of examination.

Regarding Item No.5.17: Consolidating the information to be enshrined in the Ordinance of Studies for the Degree of Philosophy (Ph. D.) of our Institute.

Item 5.17 has also been considered, deliberated upon and some amendments proposed. However, it being an extensive exercise, some more meetings and deliberations will have to be done before the exercise is complete.

Item No. 7.8   To note the starting of new M. Tech. courses in CAD / CAM, Transportation Engineering and Power Electronics and Drives under TEQIP (Ref. Item No. 5.4).

Principally, the Senate had contented to the commencement of these courses while discussing these items in its 5th Meeting. The course proposals with certain observations and modifications had to be submitted to the Chairman, Senate.

For the present meeting the Senate noted the commencement of these courses with effect from July 2006 in consonance with the existing Ordinances of the Institute and provisions and regulations of the AICTE/MHRD.

In view of the commencement of these courses w.e.f. July 2006, the minutes of this item (Item No. 7.8) were confirmed.

Item No. 7.9   To Consider modifications in scheme and syllabi of M. Tech. (Electrical Engineering) in the specialization of Power Systems and Control.

Certain modifications in the scheme & syllabi of M. Tech. (Power System) and M. Tech (Control System) as proposed by the Board of Studies of Electrical Engineering Department were considered and approved as-proposed.

Item No. 7.10   To Consider modifications in the syllabi of B. Tech. & M. Tech. Mechanical Engineering.

Certain modifications in the scheme & syllabi of B. Tech. & M. Tech. Mechanical Engineering Department as proposed by the Board of Studies of Mechanical Engineering Department were approved as proposed.

Item No. 7.11   To consider modification in the eligibility criteria for M. Tech. (Water Resources Engineering) in the Department of Civil Engineering.

The eligibility criteria for admission to M. Tech. (Water Resources Engineering) in the Department of Civil Engineering was modified to include graduate in Agriculture Engineering. The modified eligibility criteria will now be graduate in Civil Engineering/Agriculture Engineering.

This will be implemented for admissions commencing w.e.f. July 2006.

Programme	Specialization/ Department	Eligibility Criteria	
		Existing	Modified
M. Tech.	Water Resources Engineering/Civil Engg. Dept.	Graduate in Civil Engineering	Graduate in Civil Engg./ Agriculture Engg.

Item No. 7.12   To consider modifications in the Grade Based Examination System (GBES) effective from session July-2006 onward.

Sr. no.	Existing	Proposed Modification
1.	If a student gets "E" Grade in a subject, he/she can improve the grade only by re-appearing in the end-semester examinations. His/her sessional marks will remain the same as was earned	The students having 'E' Grade and less than 40% marks in the sessionals will be allowed to improve their sessional marks to maximum of 40% through regular class test series. Such students will

PM

		in the first attempt. He/she will require a total of 40 marks including sessional & new end semester exam. Marks, to pass.	be allowed to avail of one extra chance to improve the sessional marks. (Thus, a student gets practically two chances; one with his/her regular batch when he/she is attending the classes and subsequently one later, when that semester is in progress i.e. odd with odd and even with even). If such student with Grade 'E' improve their grade either 'D' or 'C' (i.e. sum of new sessional marks and highest marks in the end semester exams. which he/she *earned upto the declaration of this result*) will not be allowed to appear in the end semester examination for improving the Grade. Despite this extra chance and regular end-semester examination if he/she is unable to clear a particular subject, than he/she has to repeat the subject. This will be applicable *only* to all old students of GBES, if their sessional marks are less than 40%. *(This has been duly passed by SCSA and implemented)*
2.		If a student gets 40% of the total in sessionals, it is not necessary for him to appear in the end-semester examination and having a minimum CGPA 4.5.	For a student to pass in a subject, a separate minimum of 40% *(or D grade)* has to be earned separately, both in sessionals and end-semester examination and having a minimum CGPA 4.5.
3.		A 5 point grading system with a 25-marks range (75-100) for the 'A'(Excellent) grade.	The grading system be changed from 5-points to 7-points with 'A'(very good) grade in the range of 75% to 84% and A$^+$ (Excellent) in the range of 85% to 100%. If a student passes a subject through GRADE A to D, he/she

| | | will not be allowed to improve his/her grade. However, in a special case, where the CGPA/SGPA of student is less than 4.5, the Controller of Examinations on the a written request by the student, may allow the student to improve his/her CGPA/SGPA. |

| Sr. No | Existing | | | | Proposed Modification | | |

Table

Sr. No	Marks Obtained and Grade	Category	Grade points	Marks obtained and Grade	Category	Grade points
1	$75 \leq A \leq 100$	Excellent	10	$85 \leq A^* \leq 100$	Excellent	10
2	$65 \leq B < 75$	Good	8	$75 \leq A < 85$	Very Good	9
3	$50 \leq C < 65$	Fair	6	$65 \leq B < 75$	Good	8
4	$40 \leq D < 50$	Poor	4	$50 \leq C < 65$	Average	6
5	$E < 40$	Fail	2	$40 \leq D < 50$	Pass	4
6.				$20 \leq E < 40$	Required to Improve	2
7.				$0 \leq F < 20$	Repeat	0

*The student admitted from July 2006 onwards will be governed by the following regulations:

(i) Students with marks more than 20% but less than 40% will have the option to improve their marks and consequently grade. Such students will be allowed to avail of one extra chance to improve the sessional marks. (Thus, a student gets practically two chances; one with his/her regular batch when he/she is attending the classes and subsequently one later, when that semester is in progress i.e. odd with odd and even with even). If such student with Grade 'E' improve their grade either to 'D' or 'C' (i.e. sum of new sessional marks and highest marks in the end semester exams, which he/she earned upto the declaration of this result) will not be allowed to appear in the end semester examination for improving the Grade. Despite this extra chance and regular end-semester examination if he/she is unable to clear a particular subject, than he/she has to repeat the subject.

(ii) For students who get less than 20% marks in a subject in total of sessionals and end semester examination will be required to repeat the subject of that semester.

Allocation of theory & Sessional weightage					
Theory Papers	Sessionals (mid-semester exam. of 20 marks each and 10 marks teacher's assessment)	50	Sessionals (mid semester exam. of 15 marks each and 10 marks teacher's assessment)	40	
	End Semester Examination	50	–	60	
Practical	Sessionals (mid-semester exam. of 20 marks each and 20 marks teacher's assessment)	60	No change	60	
	End Semester Examination	40	–	40	

(i)   The above proposal will be implemented for students to be admitted from July 2006 onwards.

(ii)   For students who are detained and are to attend classes with students of lower batch, shall be governed by the academic and examination regulations of that (lower) batch.

Item No. 7.13   To consider and approve a new course in Physical Fitness of UG Students.

In view of the need to improve the physical fitness of engineering students, the office of the President Sports had been asked to initiate a viable proposal for the same.

The office of the President Sports of the Institute made a proposal to include a Course in Physical Fitness for the students of B. Tech. (1st year) commencing w. e. f. July 2006. The item was deliberated upon and some modifications were recommended in the submitted proposal. Only practical/field component of physical fitness programme comprising of the requisite duration was to be included.

In view of these changes it was decided to request the Sports Office to modify the proposal and include games and sports and schedule as expected of Engineering students.

Item No. 7.14 To consider fixing up a minimum number of classes to be engaged for a course.

The matter was deliberated upon in details. Since engaging the classes is the ethical responsibility of teachers the consensus was such that it would not be worthwhile to fix a minimum number of classes to be engaged in a semester for a particular course.

In view of all these consensus was to drop the matter.

Item No. 7.15 To consider and approve the norms for issuing the Duplicate Degree certificate and semester/overall Grade Report.

It was agreed upon in principle that the Academic Section should be empowered to issue duplicate degree certificate and grade reports.

The modalities and procedure was left to be advised by the Academic Section.

Item No. 7.16 To consider and approve the norms for issue of official Transcripts to the students Alumni.

The matter was agreed upon and the procedure for obtaining official transcripts was accepted as proposed in the agenda item 7.16.

Item No. 7.17 To consider modifications in the present Examination System (Ref. Item No. 5.13).

The report submitted by the committee was presented before the Senate and it was decided to reduce the preparatory days from present 9-10 days to 6 days.

Item No. 7.18 To consider modifications in the practice of filling up of Examination forms and late fee submission of Examination forms for the re-appearing Examinations.

The Senate felt that the practice of filling up of examination forms for the regular students is practically serving no useful purpose. Therefore, it was proposed that the present practice of submitting application forms by regular students (students studying in a particular semester after due registration at the beginning of the semester) be dispensed with. All students registered for a set of courses in a semester reach the stage of examination unless declared detained or ineligible by the Academic Section.

However, the students who are required to re-appear will have to fill up the forms as usual. The revised fee structure for filling up the examination forms for re-appearing in the subjects per semester as follows:

	Days of filling the Examination forms	Existing (Rs.)	Proposed (Rs.)
(a)	30 days before the starting of the Examination	150	300
(b)	15 days before the starting of the Examination	300	500
©	10 days before the starting of the Examination	500	1000
(d)	3 days before the starting of the Examination	-	5000

The Senate approved the proposal with modifications.
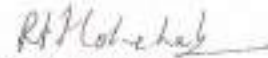
Item No. 7.19   To note the starting of the new M. Tech. Courses in the Environmental Engineering (Civil Engineering Department); Master of Business Management (Humanities & Social Sciences); M. Tech. (Robotics & Automation); M. Tech. (Nanotechnology) and UG Courses in Industrial Engineering & Management and Information Technology.

The Chairman, Senate apprised the Senate of the status of the new UG and PG courses; M. Tech. Courses in the Environmental Engineering (Civil Engineering Department); Master of Business Management (Humanities & Social Sciences); M. Tech. (Robotics & Automation); M. Tech. (Nanotechnology) and UG Courses in Industrial Engineering & Management and Information Technology which have proposed to be started from this Session 2006-07.

The Senate was informed that the AICTE had accorded the necessary approval for starting these courses and the cases had been forwarded to the MHRD for further necessary action.

The meeting ended with thanks to the Chair.

(R. P. S. Lohchab)
Registrar & Member Secretary

Approved

Sd/_
(M. N. Bandyopadhyay)
Director & Chairman, Senate

Item 8.2   To consider the Action Taken Report on the minutes of the 7th Meeting of the Senate held on 9.6.2006.

The Action Taken Report on the minutes of the 7th meeting is as under:-

Item	Minutes	Action Taken
7.1	To note the nomination of external/new members in the Senate.	No further action is required.
7.2	To confirm the minutes of the 5th meeting of the Senate held on 14.01.2006	No further action is required.
7.3	To confirm the minutes of the 6th meeting of the Senate held on 16.03.2006	No further action is required.
7.4	To consider the Action Taken Report on the minutes of the 5th meeting of the Senate held on 14.01.2006	No further action is required.
7.5	To consider the Action Taken Report on the minutes of the 6th meeting of the Senate held on 16.03.2006	No further action is required.
7.6	To report the Agenda and minutes of the 2nd and 3rd meetings of the Standing Committee on Senate Affairs (SCSA) held on 22.03.2006 and 01.05.2006, respectively	Noted by the Senate
7.7	To consider the eligibility for admission to Ph.D. Programme, Scholarships,changes in the 'Panel of Examiners' for evaluation of Ph.D. thesis and Ordinance of Ph.D. (Ref. Item No. 5.15 , 5.16 & 5.17)	The decision, as approved by the Senate has been implemented. The report submitted by the Committee constituted by the Senate is being placed before the Senate in its ensuing meeting vide item No. 8.3
7.8	To note the starting of new M.Tech. courses in CAD/CAM, Transportation Engineering and Power Electronics and Drives under TEQIP (Ref. Item No. 5.4)	Noted by the Senate.

7.9	To consider modifications in scheme and syllabi of M. Tech. (Electrical Engineering) in the specialization of Power Systems and Control Systems	The revised scheme and syllabi implemented.
7.10	To consider the modifications in the syllabi of B.Tech. & M.Tech. (Mechanical Engineering)	The revised scheme and syllabi implemented.
7.11	To consider modifications in the eligibility criteria for M.Tech. (Water Resources Engineering) in the Department of Civil Engineering	The modified eligibility criteria for admission to M.Tech.(Water Resources Engg.) implemented from the Academic Session 2006-2007.
7.12	To consider modifications in the Grade Based Examination System (GBES) effective from session July-2006 onward	The modified systems is in force for students admitted from Session July, 2006 onwards.
7.13	To consider and approve a new course in Physical Fitness of UG students	Action taken
7.14	To consider fixing up a minimum number of classes to be engaged for a course (Theory/ Practical/ Drawing/ Seminar/ Project etc.)	This item had been dropped.
7.15	To consider and approve the norms for issuing the Duplicate Degree Certificate and Semester/ Overall Grade Report	Action taken
7.16	To consider and approve the norms for issue of official Transcripts to the students/ alumni	The official transcripts are being issued to the students/alumni as per procedure approved by the Senate.
7.17	To consider modifications in the present Examination System (Ref. Item No. 5.13)	As approved by the Senate 6 days preparatory leave will be granted for ensuing exams.

7.18	To consider modifications in the practice of filling up of Examination forms and late fee submission of Examination forms for the re-appearing Examinations.	The revised system regarding filling up of Examination forms is in force and will be first implemented for the odd semester examinations due in Nov-Dec., 2006.
7.19	To note the starting of new M.Tech. courses in Environmental Engineering (Civil Engineering Department); Master of Business Management (Humanities & Social Science) M.Tech. (Environmental Engineering), M.Tech. (Robotics & Automation), M.Tech. (Nanotechnology) and UG courses in Industrial Engineering & Management and Information Technology	Admissin for the new M.Tech. courses in (i) Environmental Engg. (Civil Engg. epartment) (ii) Robotics & Automation (Mech. Engg. Deptt.) (iii) Nano Technology (Physics Deptt.) (iv) Master of Business Administration (separate Deptt.) and UG Courses in (i) Industrial Engineering & Management (IEM) (ii) Information Technology(IT) have taken place for the session commencing July, 2006.
7.20	Any other item with the permission of the Chair	----

Item 8.3   To consider the report submitted by the Committee constituted by the Senate regarding consolidation of the information to be enshrined in the Ordinance of Studies for the Degree of Philosophy (Ph.D.) of our Institute (Ref. Items 5.17 and 7.7).

The item was originally placed for discussion in the 5th meeting of the Senate vide item No. 5.17. After deliberations, a committee was constituted of the following to look into the finer points of the items and propose the appropriate recommendations:

1. Dr. S.P.Jain	Chairman
2. Dr. K.S.Kasana	Member
3. Dr. S.K.Chakarvarti	Member

A number of meetings were held to discuss the issues. During the meetings Dr. Baldev Setia, Professor Incharge (Academic Affairs & Senate) was included as a special invitee.

The report submitted by the committee is enclosed as **Annexure to Item 8.3 (on the enclosed CD).**

The Senate may kindly consider, discuss and approve the recommendations.

Item 8.4   To note the registration of Ph.D. Scholars in various Departments for the Session 2006-2007 at NIT, Kurukshetra.

The detailed status of registration of Ph.D. Scholars as on October 13th, 2006 is given below:-

S.No.	Name of the Department	Registration		
		Full time	Part-time	Total
1.	Electronics & Comm. Engg.	-	03	03
	Computer Engineering	-	04	04
	Mechanical Engineering	-	33	33
	Electrical Engineering	-	17	17
	Civil Engineering	-	11	11
	Physics	02	11	13
	Chemistry	01	08	09
	Mathematics	03	09	12
	Humanities & Social Sciences	-	05	05
	Total	06	101	107

In addition, applications were invited for fresh registrations in all the Departments during July, 2006. The Departments are in the process of finalizing these registrations.

The Senate may please note the status of registration of Ph.D. Scholars.

Item 8.5   To note the admissions status of various UG/PG Courses for the Academic Session 2006-2007 at NIT, Kurukshetra.

The AICTE and the MHRD vide their letters F.No. 765-62-203/(E)/ET/95 dated 5th June, 2006 and No. F. 22-4/2006-TS-III dated 16.6.2006 have accorded approval for introduction of new UG Courses in 'Industrial Engineering & Management' and 'Information Technology' and to increase the intake of existing UG Courses. The details of revised intake and admission status of all the UG courses are given below:

Sr.No.	Name of Course	Intake	Admissions made
	UNDERGRADUATE COURSES		
1.	Electronics & Communication Eng.	90	97#
2.	Computer Engineering	60	64#
3.	Information Technology	60	59
4.	Mechanical Engineering	90	87#
5.	Industrial Engg. & Management	60	57
6.	Electrical Engineering	90	88
7.	Civil Engineering	90	81

#including DASA & MEA category students.

In addition, the MHRD have also accorded their approval for introduction of following new PG Courses from the Academic Session 2006-2007:-

Name of the Programme	Coordinating Department	Intake
1. Environmental Engg.	Civil Engineering Deptt.	$10+3^R+5^*$
2. Robotics & Automation	Mechanical Engg. Deptt.	$10+3^R+5^*$
3. Nano Technology	Applied Physics, ECE & Computer Engg.Deptt.	$10+3^R+5^*$
4.Master of Business Administration	Deptt. of Business Administration	$46+14^R$

Admissions and subsequently classes for these courses have commenced w.e.f. Academic Session 2006-2007.

The following PG Courses have also been started under TEQIP from the Academic Session 2006-2007:

Name of the Programme	Coordinating Department	Intake
1. Transportation Engg.	Civil Engineering Deptt.	$8+2^R+5*$
2. CAD/CAM	Mechanical Engg. Deptt.	$8+2^R+5*$
3. Power Electronics & Drives	Electrical Engg. Deptt.	$8+2^R+5*$

The Admissions status of all PG Courses is given below:-

Sr.No.	Name of Course		Intake	Admissions made
	POST-GRADUATE COURSES			
1.	Soil Mechanics & Foundation Engg.		$8+2^R+5*$	01
	Structural Engg.	Civil	$8+2^R+5*$	-
	Water Resources Engg.	Engg.	$8+2^R+5*$	-
	Transportation Engg.	Deptt.	$8+2^R+5*$	03
	Environmental Engg.		$10+3^R+5*$	-
	Control System	Electrical	$8+2^R+5*$	09
	Power System	Engg.	$8+2^R+5*$	12
	Power Electronics & Drives	Deptt.	$8+2^R+5*$	08
	Electronics & Comm. Engg.	EC&CE	$10+3^R+5*$	19
	Mechanical Engineering	Mech.	$8+2^R+5*$	10
	CAD/CAM	Engg.	$8+2^R+5*$	09
	Robotics & Automation	Deptt.	$10+3^R+5*$	11
	Instrumentation	Physics	$10+3^R+5*$	13
	Nano-Technology	Deptt.	$10+3^R+5*$	10
	Master of Business Administration		$46+14^R$	60

^{R} Reserved category
* Sponsored Category

The matter is placed before the Senate for being noted.

Item 8.6   To note the creation of Department of Business Administration and admissions made to the Masters in Business Administration Course for the session 2006-2007 at NIT, Kurukshetra.

The AICTE and the MHRD vide their letters F.No. 765-62-203/(E)/ET/95 dated 5th June, 2006 and F. 22-4/2006-TS-III dated 16.6.2006 have interalia accorded approval for the introduction of a course in Master of Business Administration (MBA) w.e.f. the year 2006-07 with an intake of 60 students at NIT, Kurukshetra.

After the approval of the Board of Governors granted in their 11th meeting held on 10th July, 2006 vide item No. 11.12, the Department of Business Administration was established in the Institute.

An admission notice for admission to this course was sent to the Press on All India basis. Though it was quite late yet the Institute received an overwhelming response from all over country. The entrance test for this course was conducted on 15.7.2006 at NIT, Kurukshetra on the pattern of CAT. The admissions were made on the basis of performance of a candidate in the Entrance Test as well as a Group Discussion and interview with the ratio of 90:10. All the 60 seats as approved by the AICTE/MHRD have been filled up.

The matter is placed before the Senate for being noted.

Item 8.7 **To note the constitution of Board of Studies of course of Master of Business Administration (MBA).**

The Hon'ble Chairman, Board of Governors of NIT, Kurukshetra has on the recommendations of the Chairman, Senate constituted a separate Board of Studies for the new course in Master of Business Administration (MBA), in anticipation of approval of the Board. Accordingly, a separate PG Board of Studies for the MBA Programme has been established by the Director as under:-

Internal Members:-

1. Dr. R.C.Bhattacharjee   Chairman
    Professor in Civil Engineering
    NIT, Kurukshetra

2. Dr. P.J.Philip   Member
    Asstt. Professor
    Deptt. of Humanities & Social Sciences
    NIT, Kurukshetra

External Members:-

1. Dr.M.K.Jain   Member
    Professor & Chairman,
    Deptt. of Business Administration(2 yrs.Course)
    Kurukshetra University
    Kurukshetra

2. Dr. P.P.Sengupta   Member
    Professor & Chairman
    Deptt. of Business Administration
    NIT, Durgapur.

Further, the Board in its 11th Meeting held on 10.7.2006 vide item No. 11.12 decided that the following eminent persons be also associated as special invitees on the Board of Studies to have their expert opinion:-

1. Maj. Gen. G.K.Nischol,
    Director General
    All India Management Association
    Management House, 14, Institutional Area
    Lodhi Road, New Delhi – 110 003.

2. Sh. Pritam Singh,
   Director (or any senior faculty member)
   Management Development Institute,
   Gurgaon.

   (In case the Special Invitee as at Sr. No. 2 is not available, any senior faculty members from the same institute may be deputed).

   The Senate may note the constitution of BOS of MBA Programme

Item 8.8   To ratify the action taken by the Chairman, Senate in approving the Scheme and Syllabi of Master of Business Administration Course.

Ist meeting of the Board of Studies for MBA Programme was held on 31.07.2006. The BOS considered and approved the scheme and syllabi of MBA 1st Semester (Copy of Agenda, Minutes of 1st BOS and Scheme & Syllabi are enclosed as **Annexure- to Item 8.8**. As the classes for the MBA were to start w.e.f. July, 2007, the Scheme and Syllabi for 1st Semester was approved by the Director and Chairman of the Senate in anticipation of the approval of the Senate.

The matter is placed before the Senate for ratification.

Item 8.9   To consider modification in the existing M.Tech. Course in Computer Engineering (Part-time) at NIT, Kurukshetra.

Presently, the Institute is offering 14 M.Tech. Courses; five in the Department of Civil Engineering, three in the Department of Electrical Engineering, three in the Department of Mechanical Engineering, two in the Department of Applied Physics and one in the Department of Electronics & Communication Engineering. Also, there is a provision for one part-time M.Tech. Course (10 seats) in the Department of Computer Engineering for the permanent employees of National Institute of Technology, Kurukshetra.

An item (Item No. 11.20) was placed before the Board of Governors in its 11th meeting held on 10.7.2006 regarding need of M.Tech. Course (Part-time) in Computer Engineering not only for the permanent employees of NIT, Kurukshetra but also for other candidates outside NITK. The item is enclosed as **Appendix II** (Pages 35 to 41).

The Board decided as under:-

"The Board desired that matter regarding modifications in the scope of existing M.Tech. Course in Computer Engineering (part-time) be first considered by the Senate in its next meeting".

It is, therefore, proposed that a Part-time Course in Computer engineering be started from the Academic Session 2007-2008 in the Department of Computer Engineering not only for the permanent employees of NITK but also for other candidates outside NITK as per existing modalities Scheme and Syllabi.

The Senate may consider and decide.

NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA.

No. R/NITK/11ᵗʰ BOG/ 8394

Dated: 18/8/2006

Subject: To consider modifications in the existing M.Tech. course in Computer Engineering (Part-time), NIT Kurukshetra.(Item 11.20)

The Board of Governors of the Institute in its 11ᵗʰ meeting held on 10ᵗʰ July, 2006 vide Item No. 11.20 desired that matter regarding modifications in the scope of existing M.Tech. course in Computer Engineering (part-time) be first considered by the Senate in its next meeting.

Deputy Registrar (Academic)/Professor Incharge (Academic) are requested to place the proposal as detailed in Agenda Item 11.20 in the forthcoming meeting of the Senate.

Ancls: Agenda Item 11.20.

REGISTRAR.

To,

1. ~~~~~~~~~~ DR (Acad.)
2. Professor Incharge (Academic)/Dean(Academic)

Item 11.20   To consider modifications to the existing M. Tech. Course in Computer Engineering (Part-time) NIT Kurukshetra.

Presently, the Institute is offering 14 M.Tech. Courses; five in the Department of Civil Engineering, three in the Department of Electrical Engineering, three in the Department of Mechanical Engineering, two in the Department of Physics and one in the Department of Electronics and Communication Engineering. Also, there is a provision for one Part-time M.Tech. Course (10 seats) in the Department of Computer Engineering for the permanent employees of National Institute of Technology Kurukshetra (copy of Procedure and Admission Rules for M.Tech. Courses are given on pages 118 to 120).

It has been strongly felt that there should be an M.Tech. Course (Part-time) in the Department of Computer Engineering not only for the permanent employees of NIT Kurukshetra but also for other candidates outside NITK. It has also been necessitated in view of the growing importance of the specialization needed in field of Computer Engineering and the continuous demand of specialists in this area.

Therefore, it is proposed that a Part-time M. Tech. Course in Computer Engineering be commenced from the Academic Session 2006-07 in the Department of Computer Engineering. The modalities scheme and syllabi will be as per the existing course.

CORRIGENDUM

Page No.	Line No.	Existing	Modify
3	Para 1 (line 1)	In addition.....5* sponsored/ time candidates	In addition........5* sponsored (full-time/part-time candidates)
3	last para (last line)	Part-time courses are meant for only NIT, Kurukshetra employees on permanent posts	Part-time Computer Engineering course is meant only for NIT, Kurukshetra employees on permanent posts.
6	4 (i) line 2	(only for NIT, Kurukshetra permanent employees)	Master within brackets i.e. (only for NIT, Kurukshetra permanent employees) may be omitted
6	4 (ii) line 1	The courses are open.............. three papers in a semester.	May be read as the " *The courses are open to part-time candidates also if they are otherwise eligible under Institute's rules and the duration of studies for them will be of 6 semester.* " The remaining portion under the sub-heading may be omitted.

M.Tech Degree Courses

Courses of study are offered in the following disciplines and specialisations:

Department		Specialisation
(a) Civil Engineering	:	(i) Soil Mechanics and Foundation Engg. (ii) Structural Engg. (iii) Water Resources Engg. (iv) Transportation Engg. (v) Environmental Engg.
(b) Electrical Engineering	:	(i) Control System (ii) Power System (iii) Power Electronics & Drives
(c) Electronics & Comm. Engineering	:	(i) Electronics & Comm. Engg.
(d) Mechanical Engineering	:	(i) Mechanical Engineering (ii) CAD/CAM (iii) Robotics & Automation
(e) Physics	:	(i) Instrumentation (ii) Nano-Technology
(f) Computer Engineering	:	(i) Computer Engg. (Part-time Evening Classes only for employees of National Institute of Technology, Kurukshetra)

Teaching in each academic year is divided into two semesters. The duration of the course is semesters for regular students and six semesters for part-time students.

All the admitted candidates would be governed by the Academic Regulations for Post-Grad Programmes, as laid down by the National Institute of Technology, (Deemed University) Kurukshetra applicable w.e.f. the current session–July 2006.

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PROCEDURE AND ADMISSION RULES FOR
M.TECH. DEGREE COURSES

I. Number of Seats

Department	Specialization	Open	SC	ST	Total	Remarks
		No. of Seats				
(a) Civil Engg.	(i) Soil Mechanics & Foundation Engineering	08	1	1	10	
	(ii) Structural Engineering	08	1	1	10	
	(iii) Water Resources Engineering	08	1	1	10	
	(iv) Transportation Engineering	08	1	1	10	
	(v) Environmental Engineering	10	2	1	13	New (TEQIP) New (MHRD)
(b) Electrical Engg.	(i). Control System	08	1	1	10	
	(ii) Power System	08	1	1	10	
	(iii) Power Electronics & Drives	08	1	1	10	New (TEQIP)
(c) Electronics & Comm. Engineering	(i) Electronics & Comm. Engineering	10	2	1	13	
(d) Mechanical Engg.	(i) Mechanical Engineering	08	1	1	10	
	(ii) CAD/CAM	08	1	1	10	
	(iii) Robotics & Automation	10	2	1	13	New (TEQIP) New (MHRD)
(e) Physics	(i) Instrumentation	10	2	1	13	
	(ii) Nano-Technology	10	2	1	13	New (MHRD)
(f) Computer Engineering	(i) Computer Engineering	10	-	-	10	

In addition to the above seats, a maximum of 5* sponsored/part-time candidates (excluding Computer Engineering part – time evening classes) may be admitted to each course (Specialisation). Such candidates should be sponsored by Govt. Organisation, Public Sector Undertaking, (Regd. Under Indian Companies Act 1956), Govt./Govt. aided/Private Engineering Colleges/ Polytechnics. They should have been in regular employment with Sponsoring Organisation for a period of at least two year. However, such candidates will not be eligible for award of Institute scholarship.

If seats for any M.Tech. Degree course remain vacant, admission may be made in the even semester.

* This also includes the duly sponsored eligible employees of National Institute of Technology, Kurukshetra, for pursuing part-time 6-Semester course in the above mentioned disciplines. Part –time courses are meant for only NIT, Kurukshetra employees on permanent posts.

2. Eligibility for Admission

A candidate for being eligible for admission to the Master of Technology course under the Faculty of Engg. and Technology should have passed B.Sc. (Engg.)/ B.Tech./B.E. Degree of the affiliating University, or equivalent examination in the relevant discipline as mentioned below:

Department	Specialisation	Relevant Discipline/Qualifying Degree
(a) Civil Engg.	(i) Structural Engg.	Civil Engg.
	(ii) Soil Mechanics and Foundation Engg.	Civil Engg.
	(iii) Water Resources Engg.	Civil Engg./Agricultural Engg.
	(iv) Transportation Engg.	Civil/Structures/ Building Construction or B.Arch./ Town Planning
	(v) Environmental Engg.	Civil /Chemical/Mining Environmental Engg.
(b) Electrical Engg.	(i) Power System	Electrical Engg./ Electrical and Electronics Engg.
	(ii) Control System	Electrical Engg./ Electronics & Comm. Engg./ Electrical & Electronics Engg./ Electronics Engg./ Instrumentation & Control/ Instrumentation Engg./ Electronics & Instrumentation/ Computer Engg./Information Technology
	(iii) Power Electronics & Drives	Electrical Engg./Electrical and Electronics Engg./ Instrumentation and Control Engg.
(c) Mechanical Engg.	(i) Mechanical Engg.	Mechanical Engg./ Production Engg./ Industrial Engg.
	(ii) CAD/CAM	Mechanical Engg./ Production/Industrial Engg./ Computer Science and Engg.
	(iii) Robotics & Automation	Mechanical Engg./Electrical Engg.
(d) Electronics & Comm.	(i) Electronics & Comm. Engg.	Electronics & Comm. Engg. Electrical Engg. (Electronics Specialisation)/ Computer Engg.
(e) Physics	(i) Instrumentation	Electrical Engg. / Electronics& Comm. Engg./Instrumentation Engg./ M.Sc.(Physics) with minimum of two courses in Electronics / M.Sc. Electronics.
	(ii) Nano-Technology	B.Tech.- Nano-Technology, Electronics & Comm. Engg./ Electrical Engg./ Computer Engg./ Instrumentation Engg./ Chemical Engg./ Biotechnology/ M.Sc. (Physics/Chemistry/ Bio-Tech/Electronics)

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(f) Computer Engineering
(Part-time Evening Classes)
only for NIT, Kurukshetra
employees

(l) *Computer Engineering*

BE/B.Tech(or equivalent
In Computer Informa-
tion Technology /
Electronics & Comm.
Engg./Electrical Engg.
Or any other branch of Engg with Ist
Division
Or MCA with Ist Division (60%), or M.Sc.
Computer Science/ Software with Ist
Division or M.Sc
Physics/Mathematics/Statistics/ Electronics
with Ist Division Plus
PGDCA with Ist
Division (60%).

* The teaching will be on part-time basis. The classes will be organized outside normal Institute hours o each working day during the semester.

B.E./ B.Tech. / B.Sc. (Engg.) / B. Arch. Degrees of Indian Universities which in terms of Universit Grants Commission Act defined as Universities/ Institutions, Deemed to be University are recognized a equivalent to the corresponding examination of the Affiliating University provided the candidates concernec have passed these examination by pursuing regular courses of studies.

A candidate should have at least 60% marks (or 6.67 CGPA on 10 point scale) in qualifying examination such as B.Sc.(Engg.)/B.E./B.Tech./M.Sc.Degree Examination 50% marks or 5.56 CGPA for Scheduled Caste/Scheduled Tribes Candidates) on the basis of which the admission is being sought. For AMIE, the minimum requirement shall be 55% marks in degree.

The sponsored candidates also shall have minimum 60% marks (or 6.67 CGPA) in the qualifying degree examination (50% marks or 5.56 CGPA eligibility for SC/ST candidates). In addition, the sponsored candidates should have on the last date of applying, an experience of at least two years in the organization(s) of the types specified, out of which at least one year continuous experience should be as regular employee in the sponsoring organization.

The eligibility criteria is also given below in tabular form: -

Category of Candidates	Eligibility Criteria
General	60% marks in qualifying degree examination or CGPA 6.67 on 10 point scale
SC/ST	50% marks in qualifying examination or CGPA 5.56 on 10 point scale
AMIE	55% marks in degree
Sponsored Candidates	60% marks in qualifying degree examination or CGPA 6.67 on 10 point scale. (50% marks or CGPA 5.56 on 10 point scale, if belonging to SC/ST). On last date of applying, two years experience in the organization(s) of the types specified, out of which at least one year continuous experience should be as regular employee in the sponsoring organization

Item 8. 10   To ratify the action taken by the Chairman, Senate in transferring the M.Tech. Electrical Engineering (Sponsored Seats) to Electronics & Communication Engineering (Sponsored Seats).

The Departments of Electrical Engineering and Electronics & Communication Engineering have three and one M.Tech. Courses respectively in the following specializations. The detailed category wise break up of approved seats, is mentioned below:-

Sr.No.	Specialization	No. of Seats				
		Open	SC	ST	Sponsored	Total
Electrical Engineering Department						
1.	Control System	08	01	01	05	10+5
2.	Power System	08	01	01	05	10+5
3.	Power Electronics & Drives	08	01	01	05	10+5
Electronics & Communication Engineering Department						
1.	Electronics & Comm. Engg.	10	02	01	05	13+5

During the admissions for the Session 2006-2007 it was observed by the Admission Committee that there was a great response for admission to the M.Tech. Course in Electronics & Communication Engineering under the category of sponsored seats while the response for the analogous category in Electrical Engineering Department was lukewarm. In view of the fact that there is sufficient infrastructure and other facilities available in the Department of Electronics & Communication Engineering to accommodate some more students in the M.Tech. Programme of the Department, it was proposed by the Admission Committee to transfer two seats of sponsored category M.Tech. (Electrical Engineering) to M.Tech. (Electronics & Communication Engineering). The Chairman, Electrical Engineering Department had also given his consent for the same.

In view of above, the Chairman, Senate and Director had approved the transfer of two sponsored seats of M.Tech. Electrical Engineering Programme to M.Tech. Electronics & Communication Engineering Programme under the category of sponsored seats in anticipation of approval of the Senate (copy of proposal is enclosed as Appendix-III pages 43-44) as one time measure only.

The Senate may ratify the action taken by the Chairman, Senate in anticipation of approval of the Senate.

NATIONAL INSTITUTE OF TECHNOLOGY
KURUKSHETRA

No. D/

Dated: 19.7.2006

Subject: **Transfer of M.Tech. Electrical Engineering sponsored seats to Electronics & Communication Engineering sponsored seats.**

As per approval from Govt. of India there is sanctioned intake of 15 sponsored seats in addition to 30 seats in Electrical Engineering Department in M.Tech. programmes. Further as per approval of the Govt. of India there are 5 M.Tech. sponsored seats in the Electronics & Communication Engineering Department. During the current admissions, it has been observed that there is very poor response for admission against the sponsored seats in M.Tech. Electrical Engineering whereas there is rush for admission against sponsored seats in the M.Tech. Electronics and Communication Engineering. The matter has been discussed with Chairmen of Electrical Engineering and Electronics & Communication Engineering Departments. As intimated by Chairman of the Electronics & Communication Engg. Deptt., there is sufficient infrastructure and other facilities to accommodate a few students in the M.Tech. Electronics & Comm. Engg. against the sponsored seats in addition to the existing intake of 5 sponsored seats. Chairman of the Electrical Engineering has no objection if two of the sponsored seats are transferred to the Electronics & Communication Engineering. It is, therefore, suggested that two sponsored seats in the M.Tech. Electrical Engineering may be transferred to the Electronics & Communication Engg. Deptt. in anticipation of the approval of the Senate, so that two candidates against the sponsored seats may be admitted in M.Tech. Electronics & Communication Engineering.

Chairman, 19.77.56
Electronics & Comm. Engg. Deptt.

(K.S. Kasana)
Dean (Academic)

Director

I have examined the matter. If there is no student or applicant in M.Tech. Electrical Engg. Deptt. against sponsored seats, then there is no illegality in transferring two sponsored seats to Electronics Deptt. during this year. However, ... must be notified on the notice board ...

— From overleaf —

May be allowed as advised
by the advocate. Matter
may be reported to the
Senate in its next
meeting. This may be
as one time measure
only.

Dean (Academic)

For necessary
action please

DIR

19/7/2006

19/7/2006

19/7/2006

Item No 8.11 To onsider modification in Scheme and Syllabi of M.Tech. in CAD/CAM and Robotics & Automation (Mechanical Engineering).

M.Tech. course in CAD/CAM and Robotics & Automation started in Mechanical Engineering Department from the Academic Session 2006-2007

The Department has modified the Scheme & Syllabi of M.Tech. in CAD/CAM and Robotics & Automation. Copy of the modified Scheme is enclosed as **Appendix-IV** (Pages 46-47).

The items have been considered and approved by the Departmental Board of Studies.

The Senate may kindly consider, discuss and approve the Scheme and Syllabi.

APPENDIX - IV

DEPARTMENT OF MECHANICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA

No. MED/06/ 2364
Dated: 28.9.2006

Please refer to your note dated 28.9.2006 regarding agenda item for the forthcoming 8th meeting of the Senate -scheme & syllabii of U.G. & P.G. courses.

The department has received two P.G courses namely, 'Robotics & Automation' and 'CAD/CAM' in addition with the existing one along with a new U.G course on 'Industrial Engineering & Management' in the current session. The department has submitted scheme & syllabi for the above mentioned new P.G courses for approval of the Senate in its 7th meeting held on 9.6.06. Due to non-availability of faculty to teach the subject according to the approved scheme from the existing faculty members and from newly recruited ad-hoc faculty, the department was left with the only option to revise the scheme and introduce a few new subjects for the above new P.G. courses to run these courses in the current semester. The revised schemes as well as the syllabii of new subjects of the above new P.G. courses are returned in original for further necessary action at your end please. The syllabii of the new subjects for these P.G. Courses has already been approved by the B.O.S. of the Department in its last meeting held on 10.8.06 and submitted for approval of the Senate. The Details of these new subjects are as follows:

Course	Sem.	Course No.	Subject	Credit
Robotics & Automation	1st	MER- 101	Advanced Design of Mechanisms	3.5
		MER- 103	Mechanical Vibrations	3.5
		MER- 105	Advanced Mechanics of Solids	3.5
		MER- 107	Computer Aided Manufacturing	3.5
		MER- 109	Numerical Methods	3.5
		MER- 111	Advanced Production Tech. (Pr.)	1.5
		MER- 113	Mechanical Vibrations (Pr.)	1.5
	2nd	MER- 110	Instrumentation	3.5
		MER- 114	Instrumentation (Pr.)	1.5
	Elective	MER- 203	Advanced Manufacturing Techniques	3.5

		MEC-105	Operations Management	3.5
CAD/CAM	1st	MEC-107	Advanced Manufacturing Techniques	3.5
		MEC-113	Instrumentation (Pr.)	1.5
	2nd	MEC-102	Advanced Kinematics of Machines	3.5
		MEC-104	Numerical Methods	3.5
		MEC-106	Computer Aided Manufacturing	3.5
		MEC-108	Instrumentation	3.5
		MEC-110	Production Planning and Control	3.5
		MEC-114	Advanced Production Tech. (Pr.)	1.5

(K.C. Goyal) 29-9-06
Chairman

Encls: As stated above

Dy. Registrar (Acad)

Prof. I/c-charge (Academic)

Agenda for the 8th Senate Mtg.

DR (Acad.)

Item 8.12   To consider relaxation in requisite percentage of marks for AMIE candidates for admission in M.Tech. Degree Programmes.

A request from Col. P.K.Goyal has been received stating therein that he is interested to join the M.Tech. Programme in Civil Engineering as a sponsored category candidate in the Session 2007-2008. He has passed the AMIE Sections A & B with 53.3% marks. The requisite percentage of marks for joining the M.Tech. Programmes at the Institute is 55. This way the candidate under question is short of the required percentage by 1.7%. The candidate has requested to condone the ibid requirement of minimum eligibility from 55% and relax it to the extent of 53.3% as a special case to enable him to enhance his educational qualifications. He has corroborated his claim by the following points:-

(i)   He has been serving the Indian Army for more than 20 years now.

(ii)   Presently, he is holding the post of Commanding Officer of One Armoured Division Engg. Regiment.

(iii)   He has served the nation as a Black Cat Commando for three years.

(iv)   He has taken part in a number of counter-terrorist operations in J&K and Punjab.

(v)   He has served in Counter Insurgency Force for three years in Kupwara and Baramula Districts of Kashmir Valley and fought militancy.

It is also pertinent to mention here that at MM Engg. College, Mullana the minimum requirement of marks for the candidates having AMIE with 5 years experience is 50%.

The Senate may consider to relax the requisite pass percentage as a special case.

It is further proposed that the Senate may empower the Dean(Academic) to consider genuine cases on the recommendation of the Chairperson of the concerned Department

Item 8.13   To consider establishment of Department of Industrial Engineering and Management.

The AICTE/MHRD has accorded approval for the introduction of UG Programme on Industrial Engineering & Management with an intake of 60 students at NIT, Kurukshetra from the Academic Session 2006-2007. Subsequently the Institute has admitted students for B.Tech. course in Industrial Engineering & Management during July, 2006-2007.

A Notification No. D/aca./6536 dated 17/9.6.2006 issued by the Director stated therein that the new UG course in Industrial Engineering and Management will be started in the Department of Mechanical Engineering and its affairs will be managed by the Chairman of the Department of Mechanical Engineering. So far, no exclusive grants have been received from the MHRD/AICTE for independent functioning of the new course. Since the Scheme and Syllabi of the 1st year of the B.Tech. course of studies is common for all students irrespective of their branch, no specific decisions were to be taken by the Department.

However, the Board of Studies of the Department of Mechanical Engineering in its meeting held on 10.8.2006 has considered and recommended the constitution of a separate Department for Industrial Engineering & Management, its separate BOS, exclusive Chairman, staff and separate building for the Department. The Chairman has also submitted a brief report regarding the requirement of BOS, Staff and Building which is enclosed herewith as **Appendix - V (Pages 50 to 64).**

According to proviso to Clause 15 of the new MOA and Rules of the Institute regarding creation of a new Department, the clause reads as under:-

> "........the Board may establish or abolish one or more Departments/Centres on the recommendations of the Senate and with the prior approval of the Central Government".

The matter is placed before the Senate to decide whether a new Department is necessary to administer and run the affairs of the new UG course smoothly, effectively, economically and for a significant growth of the course and the Department.

APPENDIX - 10

DEPTT. OF MECH. ENGG.
NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA

No. MED/BOS/06/2198
Dated: 22.8.2006

Minutes of the Meeting of B.O.S. held on 10.8.06

Enclosed, please find herewith another copy of Minutes of the meeting of B.O.S in Mech. Engg. held on 10.8.2006. A copy of the same has already been sent to you under No. 2165 dated 11.8. 06.

In this meeting under Resolution No. 2(a), it is decided for submission of proposal for constitution of B.O.S, proposed Chairman of the Deptt. , its faculty, Teaching Supporting & Non-teaching staff which is enclosed herewith a report in brief is as below:.

A) Board of Studies in Indl. Engg. & Management Deptt.

1. Dr. S.K. Sharma, Chairman & P.M.E	Chairman
2. All Professors in Indl. Eng. & Mgmt. Deptt.	Member
3. Three Asstt. Profs. (Sr.)	Member
4. Three Lecturers (Sr.)	Member
5. Two outside Experts in the subject	Member

B) Faculty Required:

i)	Professors	3 Nos.
ii)	Asstt. Profs	5 Nos.
iii)	Lecturers	10 Nos.

C) Non Teaching Staff Required

iv)	Lab. Supervisor	2 Nos.
v)	Programmer	1 No.
vi)	Tech. Gr. 'A'	3 Nos.
vii)	Tech. Gr. 'B'	3 Nos.

viii)	Lab. Attendant	4 Nos.
ix)	Sr. Stenographer	1 No.
x)	Clerk	2 Nos.
xi)	Storekeeper	1 No.
xii)	Peon	1 Nos.
xiii)	Farash	1 No.

C) Building Requirement: As per norms to be decided by the Authority.

(S.K. Sharma)
Chairman

Encls: Minutes of B.O.S Mtg.

Director

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DEPARTMENT OF INDUSTRIAL ENGINEERING AND MANAGEMENT

TEACHING LOAD AND FACULTY REQUIREMENT

ODD SEMESTER

		Load
1.	First Semester	17
2.	Third Semester	81
3.	Fifth Semester	79
4.	Seventh Semester	80

Total   257

EVEN SEMESTER

		Load
1.	Second Semester	24
2.	Fourth Semester	74
3.	Sixth Semester	71
4.	Eight Semester	77

Total   246

TEACHING FACULTY REQUIRED

1.	Professor	3
2.	Assistant Professor	5
3.	Lecturer	10

(Total Teaching load per week : $3*12 + 5*14 + 10*16 = 266$ periods)

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NON TEACHING REQUIRED

1.	Farash	= 7
2.	Peon	= 1
3.	Lab Attendant	= 4
4.	Storekeeper	= 1
5.	Clerk	= 1
6.	Technician Gr. 'B'	= 3
7.	Technicians Gr. 'A'	= 3
8.	Supervisor	= 2
9.	Programmer	= 1
10.	Sr. Stenographer	= 1

The above staff may be provided in the phased manner

B. TECH. (1st SEMESTER) INDUSTRIAL ENGINEERING AND MANAGEMENT

S. No.	Course No	Subjects	Teaching Schedule (Hours)				Total Teaching load	Remarks
			L	T*	P/D	Total		
1	MET-105	Manufacturing Process	3	1	-	4	7	-
2	COE-101	Computer Engg.	3	2/2	-	4	6	Tutorial on alternate week.
3	COE-102	Computer (Lab)	-	-	2/2	2	4	Lab on alternate week
		Total					17	

B. TECH. (2nd SEMESTER) INDUSTRIAL ENGINEERING AND MANAGEMENT

S. No.	Course No	Subjects	Teaching Schedule (Hours)				Total Teaching load	Remarks
			L	T*	P/D	Total		
1	MET-101	Engineering Graphics-II	-	-	6	6	24	One teacher per fifteen students
		Total					24	

* - one tutorial section consists of 15 students; Total student intake = 60. Lecture Class will be of 60 students.

B. TECH. (3rd SEMESTER) INDUSTRIAL ENGINEERING AND MANAGEMENT

S. No.	Course No	Subjects	L	T*	P/D	Total	Total Teaching load	Remarks
1	IEM-201	Thermodynamics	3	1	-	4	7	-
2	IEM-203	Strength of Materials	3	1	-	4	7	-
3	IEM-205	Machine Drawing	-	-	4	4	7	-
4	IEM-207	Production Technology	3	1	-	4	8	Two teachers
5	IEM-209	Material science	3	1	-	4	7	-
6	IEM-211	Applied Mechanics	2	1	-	3	7	-
7	IEM-213	Production and metrics	3	1	-	4	6	-
8	IEM-215	Strength of Materials (Practical)	-	-	2	2	8	-
9	IEM-217	Production Technology (Practical)	-	-	2	2	8	-
10	IEM-219	Thermodynamics (Practical)	-	-	2	2	8	-
11	IEM-221	Applied Mechanics (Practical)	-	-	2	2	8	-
		Total	17	6	12	35	77	-

* - one tutorial section consists of 15 student
Total student intake = 60
Lecture Class will be of 60 students.

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B. TECH. (4th SEMESTER) INDUSTRIAL ENGINEERING AND MANAGEMENT

S. No.	Course No	Subjects	Teaching Schedule (Hours)				Total Teaching Load	Remarks
			L	T*	P/D	Total		
1.	IEM-202	Theory of machines	3	1	-	4	7	
2.	IEM-204	Fluid mechanics and machinery	3	1	-	4	7	
3.	IEM-206	Numerical methods	3	1	-	4	7	
4.	EcE-	Digital electronics and microprocessor architecture	3	1	-	4	-	Load to be taken by Electronics Department
5.	IEM-208	Metrology	3	1	-	4	7	
6.	IEM-210	Entrepreneurship and venture management	3	1	-	4	7	
7.	IEM-212	Metallurgy and heat treatment	3	1	-	4	7	
8.	IEM-214	Theory of machines (Practical)	-	-	2	2	8	
9.	IEM-216	Fluid mechanics and machinery (Practical)	-	-	2	2	8	
10.	IEM-218	Numerical methods (Practical)	-	-	2	2	8	
11.	IEM-220	Metrology (Practical)	-	-	2	2	8	
		Total	20	07	08	33	74	

* - one tutorial section consists of 15 students

Total student intake = 60

Lecture Class will be of 60 students.

B. TECH. (5th SEMESTER) INDUSTRIAL ENGINEERING AND MANAGEMENT

S. No.	Course No	Subjects	Teaching Schedule (Hours)				Total Teaching Load	Remarks
			L	T*	P/D	Total		
1	IEM-301	Machine design	2	-	5	7	12	Two teachers
2	IEM-303	Operations Research	3	1	-	4	7	-
3	IEM-305	Work study and ergonomics	3	1	-	4	7	-
4	IEM-307	Layout planning and value engineering	3	1	-	4	7	-
5	IEM-309	Production planning and control	3	1	-	4	7	-
6	IEM-311	Heat Transfer	3	1	-	4	7	-
7	IEM-313	Work study and ergonomics (Practical)	1	-	3	3	8	-
8	IEM-315	Entrepreneurship (Practical)	-	-	2	2	8	-
9	IEM-317	Basic industrial engineering (Practical)	-	-	2	2	8	-
10	IEM-319	Heat transfer (Practical)	-	-	2	2	4	-
11	IEM-321	Machine design (Viva-Voce)	-	-	1	1	-	-
12	IEM-323	Vocational Training	-	-	-	-	-	-
		Total	17	3	13	35	79 / 29.0	

* – one tutorial section consists of 15 students. Total student intake = 60. Lecture Class will be of 60 students.

B. TECH. (6th SEMESTER) INDUSTRIAL ENGINEERING AND MANAGEMENT

S. No	Course No	Subjects	Teaching Schedule (Hours)				Total Teaching Load	Remarks
			L	T*	P/D	Total		
1	IEM-302	Operations management	4	1	-	5	6	-
2	IEM-304	Materials management	4	1	-	5	6	-
3	IEM-306	Industrial quality control	4	1	-	5	6	-
4	IEM-	Elective I	4	1	-	5	6	-
5	IEM-308	Mechatronics	3	1	-	4	7	-
6	IEM-310	Non-conventional manufacturing processes	4	1	-	5	6	-
7	IEM-312	Advanced Production Technology (Practical)	-	-	2	2	6	-
8	IEM-314	Mechatronics (Practical)	-	-	2	2	6	-
9	IEM-316	Seminar-I	-	-	1	2	6	-
	Total		29	6	06	35	71	-

* - One tutorial section consists of 15 students. Total student intake = 60, Lecture Class will be of 60 students.

B. TECH. (7th SEMESTER) INDUSTRIAL ENGINEERING AND MANAGEMENT

S. No.	Course No.	Subjects	Teaching Schedule (Hours)				Total Teaching Load	Remarks
			L	T*	P/D	Total		
1	IEM-401	Network and project management	4	1	-	5	8	-
2	IEM-403	CAD/CAM	4	1	-	5	8	-
3	IEM-405	Strategic entrepreneurship	4	1	-	5	8	-
4	IEM-	Elective II @	4	1	-	5	8	-
5	IEM-	Open Elective I*	4	1	-	5	8	-
6	IEM-409	CAD/CAM (Practical)	-	-	2	2	8	-
7	IEM-405	Project-I	-	-	6	6	24	Five students per project group per teacher
8	IEM-411	Seminar-II	-	-	2	2	8	-
9	IEM-413	Practical Training Report	-	-	-	-	-	-
		Total	20	5	10	35	80	-

*- one tutorial section consists of 15 students. Total student intake = 60, Lecture Class will be of 60 students.

B. TECH. (8ᵗʰ SEMESTER) INDUSTRIAL ENGINEERING AND MANAGEMENT

S. No	Course No	Subjects	Teaching Schedule (Hours)				Total Teaching load	Remarks
			L	T*	P/D	Total		
1	IEM-402	Industrial inspection and non-destructive testing	3	1	-	4	7	-
2	IEM-404	Maintenance and reliability engineering	3	1	-	4	7	-
3	IEM-406	Total quality management	4	-	-	4	8	-
4	IEM -	Elective III*	4	-	-	4	8	-
5.	IEM -	Open elective §	3	1	-	4	7	-
6.	IEM-410	Non-destructive testing (Practical)	-	-	2	2	2	-
7.	IEM-412	Project-II	-	-	9	9	24	Five students per project group per teacher
8.	IEM-411	Seminar-II	-	-	2	2	8	-
9.	IEM-414	Comprehensive Viva-Voce	-	-	-	-	-	-
10	IEM-416	General Fitness and Professional Aptitude (Viva-Voce)	-	-	-	-	-	-
		Total	17	5	13	35	77	-

* - one tutorial section consists of 15 students. Total student intake = 60. Lecture Class will be of 60 students.

DEPTT. OF MECH. ENGG.
NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA

No. MED/BOS/06/-
Dated: 10.8.2006

Minutes of the Meeting of B.O.S held on 10.8.06

Minutes of the meeting of the Board of Studies (B.O.S) in Mech. Engg. of N.I.T. Kurukshetra held on 10.8. 2006 at 4.30 P.M. in the Conference Room of the Deptt.. The following members were present:

1.	Dr. S.K. Sharma, P.M.E	Chairman
2.	Dr. T.K. Garg, P.M.E.	Member
3.	Dr. K.C. Goyal, P.M.E.	Member
4.	Dr. S.S. Rattan, P.M.E	Member
5.	Dr. Sudhir Kumar, P.M.E	Member
6.	Dr. Dinesh Khanduja, APME	Member
7.	Dr. R. Vasudevan, APME	Member
8.	Dr. Dixit Garg, APME	Member
9.	Prof. S.C. Gupta, LME	Member
10.	Prof. Rajiv Verma, LME	Member

Decisions

Item No. 1: Confirmation of the minutes of the last meeting held on 10.5.06 .

Resolved that the minutes of the last meeting held on 10.5.06 were confirmed.

Item No. 2: Constitution of Industrial Engg. & Management Deptt.

a) The B.O.S. has considered constitution of separate Department, its separate B.O.S.. Independent Chairman of its Deptt. & other faculty & separate buildings of the Deptt.

b) The B.O.S. has also approved its Scheme & syllabus which is attached as Annexure "A".

Item No. 3: Appointment of Examiners for M.Tech. Student

The Examiners for M.Tech. Dissertation (ML-699) were decided and approved as an Annexure 'B' (to be sent separately to Controller of Exams., N.I.T, Kurukshetra under confidential cover).

Item No. 4: To modify the B.Tech.(Mech.) Syllabi.

The B.O.S. has gone through the scheme of B.Tech. (Mech.) and minor modifications in the same has been suggested to be amended a copy of which (modified) is attached herewith.

Item No. 5: To consider the recommendation of DRC for registration to Ph.D Candidates.

The Board of Studies approved the recommendation of the DRC for registration to Ph.D.of the 12 Candidates, summary of the candidates will be sent separately to Dean (Acad).

Item No. 6: To consider the Course Coordinators for B.Tech. & M.Tech.

The Board of Studies dropped this item us there is no need to place this before the B.O.S.

Item No. 7: To consider the introduction of new M.Tech. (CAD/CAM) course & other associated matters.

The Board of Studies consider and approved the introduction of M.Tech. (CAD/CAM) under supervision of the Deptt. of Mech. Engg. and also approved its scheme & syllabi as Annexure 'E'.

Item No. 8: To Consider the introduction of new M.Tech. (Robotics & Automation) course & other associated matters

The Board of Studies consider and approved the introduction of M.Tech. (Robotics & Automation) under the supervision of Deptt. of Mech. Engg. and also approved its scheme & syllabi as Annexure 'F'.

Item No. 9: Under Any other item(s)

a) The Board of Studies considered & approved the recommendation of DRC for change of 2nd Supervisor as Dr. Vishal Santooh Sharma of N.I.T. Jalandhar instead of Dr. Puneet Tandon, Ex-APME in the Ph.D. case of Mr. Sandeep Singhai.

The meeting ended with vote of thanks to the Chair.

(S.K. Sharma)
Chairman, B.O.S. in Mech. Engg.

All Members

1. Controller of Exams., N.I.T.K.
2. Dean (Acad.), N.I.T.K
3. Director, N.I.T.K.

Item 8.14   To consider establishment of Department of Information Technology.

The AICTE/MHRD has accorded approval for the introduction of UG Programme on Information Technology with an intake of 60 students at NIT, Kurukshetra from the Academic Session 2006-2007.   Subsequently the Institute has admitted students for B.Tech. course in Information Technology during July, 2006-2007.

A Notification No. D/aca./6536 dated 17/9.6.2006 issued by the Director stated therein that the new UG course in Information Technology will be started in the Department of Computer Engineering and its affairs will be managed by the Chairman of the Department of Computer Engineering. So far, no exclusive grants have been received from the MHRD/AICTE for independent functioning of the new course. Since the Scheme and Syllabi of the 1st year of the B.Tech. course of studies is common for all students irrespective of their branch, no specific decisions were to be taken by the Department.

However, the Board of Studies of the Department of Computer Engineering in its meeting has considered and recommended the constitution of a separate Department for Information Technology, its separate BOS, exclusive Chairman, staff and separate building for the Department. The Chairman has also submitted a brief report regarding the requirement of BOS, Staff and Building which is enclosed herewith as **Appendix – VI (Pages 66 to 67).**

According to proviso to Clause 15 of the new MOA and Rules of the Institute regarding creation of a new Department, the clause reads as under:-

> "........the Board may establish or abolish one or
> more Departments/Centres on the recommendations of the
> Senate and with the prior approval of the Central
> Government".

The matter is placed before the Senate to decide whether a new Department is necessary to administer and run the affairs of the new UG course smoothly, effectively, economically and for a significant growth of the course and the Department.

COMPUTER ENGINEERING DEPARTMENT, NIT KURUKSHETRA

No.CO/

Date: 19.8.06

Sub: Proposal for New Department of Information Technology

PROPOSED AGENDA ITEM FOR APPROVAL OF SENATE

For the recently started B.Tech.Course in Information Technology, it is proposed to establish a new Department. A separate Department is required as the focus of B.Tech. Information Technology should be as per the present IT revolution. The department will require establishment of sufficient infra-structure in terms of offices, labs, lecture/tutorial rooms. It is proposed to sanction teaching and non-teaching posts as per AICTE norms. These posts should be filled in proportionately every year for 3-4 years consecutively. The purpose of this department would also be to try to start PG and Ph.D programmes and other activities as per the then industrial requirement.

The initial seed money for the infrastructure development and other facilities for this new department is estimated to be around Rs.200 lacs. The scheme and syllabi for the B.Tech. IT curriculum has to be approved by the departmental B.O.S. Hence it is proposed to constitute the Department and an interim B.O.S. so that the above curriculum may be got approved. It is proposed that the following interim B.O.S. may also be got approved by the Senate:

1	Dr. K. Gopal, Prof. & DEAN (P&D) NIT, Kurukshetra & Former Chairman B.O.S. B.Tech (IT), KUK	Chairman
2	Chairman, Computer Engg. Deptt., NIT, Kurukshetra	Member Secretary / Convener
3	Chairman, ECE & CE Deptt., NIT, Kurukshetra	Member
4	Dr.A.K.Singh, Asstt.Prof., Computer Engg. Deptt., NIT, Kurukshetra.	Member
5	Dr.J.K.Chhabra, Asstt.Prof., Computer Engg. Deptt., NIT, Kurukshetra.	Member
6	Dr.Lalit Kumar, Professor, Computer Sc.& Engg. Deptt. NIT, Hamirpur(H.P.).	External Expert
7	Dr.M.C.Govil, Professor, Computer Sc. & Engg.Deptt. MNIT, Jaipur (Raj.)	External Expert

Further, the following teaching/non-teaching faculty (inclusive of Ist year) will also be required:

1. Professors   4 nos.
2. Asstt.Professors   8 nos.
3. Lecturers   16 nos.
4. Non-Teaching (1 : 1.5)   42 nos.

Again the latest position of this Course available in the reputed Institutes of India is enclosed please. Submitted for kind consideration and approval of the Senate.

Dean (Academic)

(Mayank Dave)
Chairman

67 कृ ०५ ६७

Sr.No.	Name of Institute	Separate IT Deptt.
1	NIT, Durgapur	Yes
2	NIT, Bhopal	Common with CSE
3	NIT, Hamirpur	No such course
4	NIT, Surathkal	Yes
5	NIT, Tiruchirapalli	No such course
6	NIT, Calicut	Yes
7	NIT, Warangal	No such course
8	IIT, Bombay	Separate for R&D activities
9	IIT, Madras	No such course
10	IIT, Kanpur	No such course
11	NIT, Allahabad	No such course
12	Punjab Engg. College, Chandigarh	Yes

Dave
(Mayank Dave)
Chairman

Item 8.15   To consider introduction of new UG course in B. Pharmacy.

In order to keep pace with the rapid increase in population, the health hazards associated with industry and agriculture have increased manifold. The field of medicine and pharmacy is under constant stress to combat the menace of these health hazards. Hence to improve the health, improving the quality of life and meeting the requirements of increasing population trained manpower in the area of pharmacy is the need of the hour.

Keeping in mind the importance of research and development in the area of pharmaceuticals, developing the manpower of specialized knowledge, development of the country and mankind, it is proposed to start a new UG Course in Pharmacy (B.Pharmacy) from the next Academic Session at NIT, Kurukshetra with an intake of 60.

The proposal may also be viewed in light of the vision document approved by the Board. The Board of Governors had also approved the Institute Road Map in its 9th meeting held on 25.2.2006 which suggests introduction of additional UG and PG Programmes in Engineering, Applied Sciences and Management streams to have optimal utilization of the existing infrastructure as well as to produce additional skilled human resources in emerging fields.

The said course will be self sustaining without any financial liability on the Central Government. After getting the approval from the Central Government, the details regarding fee structure, criteria of admission etc. will be worked out and submitted to the Senate for its consideration and decision.

The existing infrastructure and facilities can be extended for use for the new course. The MHRD will be approached in order to meet the non-recurring expenditure for setting up of the new department, infrastructure and other facilities.

The Senate may consider to start the new UG Course in B.Pharmacy, creation of a separate Department, its separate BOS, exclusive Chairman, faculty, staff, and separate building for the Department. The recommendations of the Senate will be considered by the Hon'ble Board.

Item No 8.16   To Consider modifications in the Syllabus of the course on
ECT-403 Physical Design of Digital IC's of B.Tech. VIIth
Semester (Ec&CE).

The Department of Electronics & Communication Engineering has modified the
Syllabus of the course on ECT-403 "Physical Design of Digital IC's" of B.Tech. 7th
Semester. Copy of the Syllabus is enclosed as **Appendix VII (Page 70)**.

The items have been considered and approved by the Departmental Board of
Studies.

The Senate may kindly consider, discuss and approve the modifications.

APPENDIX – VII

B.TECH VIIth SEMESTER
PHYSICAL DESIGN OF DIGITAL IC's.
(ECT-403)

L T F
3 2 -

End Semester:50
Sessional : 50
Time   :3Hrs

UNIT 1 :

nMOS & CMOS Fabrication Processes , BiCMOS Technology, nMOS, CMOS and BiCMOS Inverters, Latch up in CMOS, Latchup susceptibility in BiCMOS.
MOS Layers, Stick Diagram representation of nMOS and CMOS circuits.

UNIT 2 :

Design Rules, Mask Layout, Sheet Resistance and area capacitances, Delay calculations, Large capacitive loads, wiring capacitances, Choice of layers, Scaling of MOS circuits, CMOS logic structures – CMOS, BiCMOS, Pseudo nMOS, Dynamic CMOS, CCMOS, CMOS Domino Logic, Zipper CMOS, Cascade Voltage Switch Logic, SFPL Logic.

UNIT 3:

CMOS Logic Design – Fan in and Fan out, NAND/NOR Delays, Transistor Sizing, Physical Design of Logic gates – Inverter, NAND, NOR, Standard cell design, Gate array layout, Sea-of Gate layout, Layout Optimization, 2-input Multiplexer.

UNIT-4:

Clocking Strategies – Clocked Systems, Latches and Registers, System Timing, Single phase memory structures, PLL clock Technologies, Meta stability and synchronization failures, single phase logic structures, Two phase and four phase clocking, memory and logic structures.

Suggested Books:

1. Pucknell DA & Eshraghian K, Basic VLSI Design, PHI (1995).
2. Weste N.H.E. & Eshraghian K, 'Principles of CMOS Design' Pearson Education (2000)

Item 8.17 To note relaxation in attendance of 7th and 8th Semester.

The proposal regarding reduction of the contact hours of studies of 7th & 8th Semester was put up before the Senate in its 7th meeting held on 9.6.2006. The senate decided to constitute a committee of all Deans and Chairmen of the Departments to look into this item. The above committee met on 14.6.2006 and decided to reduce the five contact period of each branch in 7th & 8th Semester so that more time is available for preparation of competitive examinations, higher and allied studies and campus placements.

The detail of reducing the contact hours of B.Tech. 7th Semester & 8th Semester is given below:-

S. No	Course No.	Subject	Teaching Schedule withdrawn from		
			L	T	P
COMPUTER ENGINEERING (7th Semester)					
1.	COT-401	Internet & Intranet Engineering	1		
2.	COT-405	Statistical Models for Computer Science	1		
3.	COT-411	Computer networks Lab.			1
4.	COT-415	Minor Project			1
	COT-417	Seminar		1	
COMPUTER ENGINEERING (8th Semester)					
1.	COT-402	Web Engineering	1		
2.	COT-404	Compiler Design	1		
3.	COT-412	Web Engineering(P)			1
4.	COT-414	Major Project		·	1
5.	COT-416	Seminar			1
ELECTRONICS & COMMUNICATION ENGINEERING (7th Semester)					
1.	-	Departmental Elective-1		1	
2.	ECT-403	Physical Design of Digital ICs		1	
3.	ECT-407	Electronic Switching System	-	1	-
	ECT-409	Electronic Switching System	-	1	-
	ECT-411	Digital Signal Processing (Pr.)	-	-	1
ELECTRONICS & COMMUNICATION ENGINEERING (8th Semester)					
	-	Departmental Elective-II	-	1	-
	ECT-406	Wireless and Mobile Communication	-	1	
	ECT-408	Transport & Access Technologies	-	1	
	ECT-410	Neuro-Fuzzy Systems	-	1	
	ECT-416	Audio Visual Electronics (Pr.)	-	-	1

MECHANICAL ENGINEERING (7th Semester)

MET-401	Automobile Engineering	1	-	-
MET-403	Measurement & Control	1	-	-
-	Elective-I	1	-	-
MET-405	Statistical Quality Control and Reliability	1	-	-
MET-409	Project-I	-	-	1

MECHANICAL ENGINEERING (8th Semester)

-	Elective-II	1	-	-
MET-404	Power Plant Engineering	1	-	-
MET-410	Project-II	-	-	2
MET-411	Seminar	-	-	1

ELECTRICAL ENGINEERING (7th Semester)

ET-405	Seminar-I	-	1	-
ET-407	Advance Programming & Software Engg. Lab (Pr.)	-	-	1
ET-409	Computer Methods in Power System Lab (Pr.)	-	-	1
ET-411	Minor Project (Pr.)	-	-	1
ET-429, 431, 433, 435	Design Project-I (Pr.)	-	-	1

ELECTRICAL ENGINEERING (8th Semester)

ET-406	Seminar-II	-	1	-
ET-408 ET-410	High Voltage Engg. Lab (Pr.) Reliabilty Engg. Lab (Pr.)	-	-	1
ET-428, 430, 432, 434	Design Project-II (Pr.)	-	-	1
ET-436, 438, 440, 442	Major Project (Pr.)	-	-	2

CIVIL ENGINEERING (7th Semester)

CET-409	Concerete Structures-II (Drg.)	-	-	1
CET-411	Irrigation Engg. Design & Drawing	-	-	1
CET-413,415, 417	Departmental Elective-I	-	1	-
CET-427, 429, 431	Project-I	-	-	2

CIVIL ENGINEERING (8th Semester)

CET-408	Estimation & Accounts (Pr.)	-	-	1
CET-410, 412	Departmental Elective-II	1	1	-
CET-426, 428	Project-II	-	-	2

The matter is placed before the Senate for being noted.

Item 8.18   To consider relaxation in criteria so as to award additional chance to old students to complete their B.Tech. Degree Course.

The following students who could not pass their B.Tech. Degree Course within the maximum period of eight years had requested in November/ December, 2005 for relaxation in criteria for award of additional/mercy chance to enable them to complete their B.Tech. Degree Course (Old Scheme).

S.No.	Roll No.	Name
1.	94148	Deepak Chaudhary (Mech.)
2.	96255	Ram Singh (Civil)
3.	97176	Parminder Pal(Electrical)
4.	97915	Manish Gaur (Computer)
5.	97228	Lalit Baggan(Electrical)

The request of the above students was declined by the Standing Committee on Senate Affairs (SCSA) in its 3rd meeting held on 1.5.2006 in the light of the Ordinance of the Institute. This matter was placed before the Senate in its 7th meeting held on 9.6.2006 but this matter could not be discussed by the Senate.

Now we have received a request from another student, Mr. Sitender Kumar Chedwal, Roll No. 98197 who has been left with only one paper to clear his B.Tech. Degree Course. The office has recommended his case for relaxation of the criteria so as to award him an additional chance to complete his degree on the following grounds:-

i)   Only one paper has been left.

ii)   The fact that at one point of time (during the tenure of eight years) he and his batchmates were not allowed to appear in all the semester exams as the Institute had conducted the exam for regular semesters only (i.e. odd with odd and even with even semester). This deprived him of one chance that he would have otherwise availed.

iii) He has completed eight years in July, 2006.

iv)   It is a case closest to obtaining the degree.

It is also pertinent to mention here that prior to the decision of SCSA meeting held on 1.5.2006 all the students who had applied for mercy/additional chance, they had been allowed by the Director on the recommendations of the Dean(Academic) with a penalty of Rs. 5000/- plus examination admission fees per semester.

It may also be added here that prior to upgradation of the Institute to the Deemed University status when the above student had been admitted at this Institute, the rules and regulations of Kurukshetra University, Kurukshetra(KUK) were followed and the KUK had been allowing the additional/mercy chances to the students appearing in KUK.

The Senate may consider the request of the above student and decide the matter.

Further, keeping in view the above facts and as the case of above students could also not be discussed in the Senate, the office is of the view that as per past practice being followed in RECK and NITK, relaxation in criteria to all old students as a one time measure be considered by the Senate.

Submitted for consideration and decision.

Tabled
Item 8.19

To Consider the Scheme and Syllabi of 1st & 2nd Semester
M.Tech. in Nano Technology.

M.Tech. course in Nano-Technology has been started in the Department of Physics from the Academic Session 2006-2007.

The Department has modified the Scheme & Syllabi of 1st & 2nd Semester M.Tech. in Nano-Technology. Copy of the modified Scheme and Syllabi is enclosed as **Appendix-VIII (Pages 76-91).**

The items have been considered and approved by the Departmental Board of Studies in its meeting held on 17.10.2006.

The Senate may kindly consider, discuss and approve the Scheme and Syllabi.

DEPARTMENT OF PHYSICS
NATIONAL INSTITUTE OF TECHNOLOGY, KURUKKSHETRA

MASTER OF TECHNOLOGY (NANOTECHNOLOGY)

[W.E.F. 2006-07]

FIRST SEMESTER

Course No.	Title	Schedule of Teaching				Credit Points
		Lecturer	Tutorial	Practical	Total	
PhNT-101	Solid State Physics	4	–	–	4	4
PhNT-103	Foundations of Nanoscale Science and Technology	4	–	–	4	4
PhNT-105	Electronic and Optical Properties of materials	4	–	–	4	4
	*Elective	4	–	–	4	4
PhNTL-101	Lab 1: Nano/micro Synthesis Instrumentation and Sensor Lab	–	–	8	4	4
	Total	16	–	8	20	20

*Electives:

PhNT-107:Materials Science
PhNT-109:Atomic and Electronic Structure of Matter
PhNT-111:Introduction to Materials
PhNT-113:Photonics

Weightage:

For Theory Courses	: During Semester Evaluation Weightage	= 50%
	End Semester Examination Weightage	= 50%

For Laboratory Courses	: During Semester Evaluation Weightage	= 60%
	End Semester Examination Weightage	= 40%

M. TECH 1ˢᵗ SEMESTER NANOTECHNOLOGY

SOLID STATE PHYSICS : PhNT-101

L	T
4	0

CREDITS	:4
END SEMESTER EXAM MARKS	:50
SESSIONAL MARKS	:50
EXAMINATION DURATION(HOURS)	:3

CRYSTAL PHYSICS:

Periodic array of atoms, translation vectors, unit cell, space lattice, Miller indices, simple crystal structures, bonds in solids, nanocrystalline solids, physical properties of nanomaterials, melting points and lattice phonons, constants, mechanical properties.

X-ray diffraction methods and their applications in identification of crystal structures, Geometric factor reciprocal lattice.

LATTICE VIBRATIONS AND THERMAL PROPERTIES OF SOLIDS:

Concept of lattice vibrations and thermal heat capacity, classical, Einstein and Debye theories of molar heat capacity and their limitations, concept of phonons.

BAND THEORY OF SOLIDS:

Origin of bands, band theory of solids, motion of electron in periodic field of crystal, Kronig-Penny model, Brillouin zones, concept of holes, distinction between metal, insulator and semi- conductor, Hall effect, size effect on energy gap- quantum confinement, quantum dots.

SEMICONDUCTORS:

Intrinsic semiconductors, doping and extrinsic semiconductors, simple models for semiconductors, Donor and acceptor levels, p-n junction and rectification, tunneling and resonant tunneling, Hall effect in semiconductors

REFERENCE BOOKS:

1. Introduction to Solid State Physics
   C. Kittel
2. Solid State Physics
   A.J. Dekker
3. Solid State Physics
   S.O. Pillai
4. Nanostructures and Nanomaterials
   Guozhong CaO, Imperial College Press, 2006

M. TECH 1st SEMESTER NANOTECHNOLOGY

FOUNDATIONS OF NANOSCALE SCIENCE AND TECHNOLOGY: Ph NT-103

L	T		CREDITS	:4
4	0		END SEMESTER EXAM MARKS	:50
			SESSIONAL MARKS	:50
			EXAMINATION DURATION(HOURS)	:3

NANOTECHNOLOGY:
Background, what is nanotechnology, types of nanotechnology and nano-machines, top down and bottom up techniques, Molecular nanotechnology, atomic manipulation-nanodots, self-assembly, Dip pen nanolithography, Simple details of characterization tools- SEM, TEM, STM, AFM.

NANOMATERIALS:
What are nanomaterials? Preparation of nanomaterials-Plasma arcing, Chemical Vapor Deposition, Sol-gels techniques, Electrodeposition, Ball Milling, Natural nanomaterials, Applications of nanomaterials-Insulation materials, Machine tools, Phosphors, Batteries, High power magnets Medical implants.

CARBON TUBES:
New forms of carbon, Carbon tubes-types of nanotubes, formation of nanotubes, Assemblies, purification of Carbon nanotubes, Properties of nanotubes, applications of nanotubes.

OPTICS, PHOTONICS AND SOLAR ENERGY:
Light and nanotechnology, Interaction of light and nanotechnology, Nanoholes and photons, Solar cells, nanoparticles and nanostructures; Optically useful nanostructured polymers, Photonic Crystals.

NANOELECTRONICS:
Introduction, Tools of Micro- and nanofabircation-optical and electron beam lithography, Molecular beam lithography, Quantum electronic devices, Molecular electronics, Simple ideas about quantum computers.

FUTURE APPLICATIONS:
MEMs, robots, Nanomachines, Nanodevices, New Computing System, Opto-electronic devices, Environmental applications, Nanomedicine, Biological nano-technological future.

REFERENCE BOOKS:
1. Nanotechnology-Basic Science and Emerging Technologies
   Mick Wilson, Kamali Kannangra Geoff Smith, Michelle Simons and Burkhard Raguse, Overseas Press.
2. Nanotechnology-A Gentle Introduction to the Next Big Idea
   Mark Ratner and Daniel Ratner, Prentice Hall
3. Nanotechnology
   Rebecca L Johnson, Lerner Publications.
4. Introduction to Nanotechnogy
   Charles P. Poole Jr., Chapman and Hall/CRS

M. TECH 1st SEMESTER NANOTECHNOLOGY

ELECTRONIC AND OPTICAL PROPERTIES OF MATERIALS: Ph NT-105

L	T		CREDITS	:4
4	0		END SEMESTER EXAM MARKS	:50
			SESSIONAL MARKS	:50
			EXAMINATION DURATION(HOURS)	:3

OPTICAL PROPERTIES OF MATERIALS:

Photoconductivity: Photoconductivity in insulating crystals, variation with illumination, effect of traps, space charge effects, applications of photoconductivity. Luminescence: Fluorescence, Phosphorescence phosphors, various types of luminescences. Photoluminescent & electro luminescent properties of porous silicon. Fluorescence, Thermo luminescence and photoluminescence of Nanoparticles.

OPTICAL PROPERTIES OF QUANTUM DOTS:

Excitons: Weekly bound excitons, tightly bound excitons, excitons in molecular crystals and in nanostructures.

NON-LINEAR OPTICS:

Non-linear optical susceptibility second and third order optical susceptibilities. Harmonic Generation, Multiple photon excitation. Stimulated Raman Scattering. Stimulated Brillouin Scattering. Non-linear optical properties of nano structures

OPTICAL PHENOMENA IN NANOMATERIALS:

Surface enhanced optical phenomena in nanostructured fractal materials. Linear and non-linear spectroscopy of semiconductor nano crystals

ELECTRONIC PROPERTIES OF MATERIALS:

Classical free electron theory and its limitations, quantum theory of free electrons, Density of states, Fermi level, Semiconductor lasers, Size effects on the band gap of semiconductor, Quantum-dot lasers.

ELECTRONIC PROPERTIES OF NANO-MATERIALS:

Theory of Electronic Conduction through Organic molecules: Theoretical model, Factors affecting the current voltage-characteristics. Electronic Properties of Molecular Nano-structures, cluster arrays & networks: Experimental considerations Electronic properties of individual Molecules, Electronic conduction through supported clusters, Electronic properties of Encapsulated gold clusters, Estimating the Electrical Resistance of a molecule, Electrical measurements and conduction model. Majority Carrier Injection devices, Single-Electron Electronics in Silicon-Based Nanostructures. Conductive properties of porous silicon.

ELECTRICAL PROPERTIES OF NANO MATERIALS:

Electrical Properties of zero-Three Dimensional Arrangements of Nanoparticles: Single-Particle Properties, One, Two and Three Dimensional Arrangements.

REFERENCE BOOKS:

1. Optical Electronics
   A Ghatak & K.Thyagarajan
2. Quantum Electronics
   A Yariv
3. Solid State Physics
   Charles Kittel
4. Optics-
   Eugene Hecht
5. Nanomaterials synthesis, properties and applications
   Edelstein A.S and Cammarata RC
6. Handbook of Nanostructured Materials and Nanotechnology Electrical Properties Vol.3
   Hari Singh Nalwa
7. Handbook of Nanostructured Materials and Nanotechnology, Optical Properties Vol.4
   Hari Singh Nalwa

M. TECH 1ˢᵗ SEMESTER NANOTECHNOLOGY

MATERIAL SCIENCE: PhNT - 107

L	T
4	0

CREDITS	:4
END SEMESTER EXAM MARKS	:50
SESSIONAL MARKS	:50
EXAMINATION DURATION(HOURS)	:3

INTRODUCTION:
Classification of materials, Structure property relationship in material, multiphase materials, Modern materials – polymers, ceramics, composite, nanomaterials.

CRYSTAL IMPERFECTIONS:
Point and line imperfections, Frankel Defects, Schottky defects, dislocations, Burger Vectors, Surface imperfections, Stacking faults.

DIFFUSION IN SOLIDS:
Fick's law of diffusion, Temperature dependence of diffusion coefficients, The Kirkendall effect, the atomic model of diffusion.

MAGNETIC MATERIALS:
Magnetic behaviour of materials, classification of magnetic material, Ferromagnetism and Antiferromagnetism, The soft and hard magnetic materials, magnetic bubbles and magnetic bubble memory.

DIELECTRICS:
Polarization and dielectric constant, Basic relationships, Frequency and temperature dependent dielectric constant, Claussius Mossotti equation, dielectric loss factor, basic considerations, relaxation time and activation energy, tangent of dielectric loss angle, displacement and complex dielectric constant and basic equations, ferrites.

SUPERCONDUCTORS:
Zero resistivity, critical magnetic field and critical current density, Meissner effect, Type I & II Superconductors, Josephson effect, High Tc superconductors, BCS theory of superconductivity.

REFERENCE BOOKS:
1. Material Science and Engineering
   V.Raghavan
2. Introduction to Materials Science for Engineers
   James F.Shackelford
3. Electrical Properties of Materials
   G.C.Jain
4. Material Science
   A.J.Dekker

M. TECH 1st SEMESTER NANOTECHNOLOGY

ATOMIC AND ELECTRONIC STRUCTURE OF MATTER : Ph NT-109

L	T			
4	0	CREDITS		:4
		END SEMESTER EXAM MARKS		:50
		SESSIONAL MARKS		:50
		EXAMINATION DURATION(HOURS)		:3

DEVELOPMENT AND CONCEPTS OF ATOMIC PHYSICS:
The Bohr. Atom model and its developments, the quantum mechanics of atoms, radiative transitions between discrete states of atoms, continuous spectra.

THE HYDROGEN ATOM:
Electron states of the Hydrogen atom, fine splitting of levels of hydrogen atom, superfine splitting and isotope shift of levels of Hydrogen atom.

TWO-ELECTRON ATOMS:
The Pauli's exclusion principle and symmetry of the atomic wave function, the helium atom.

LIGHT AND HEAVY ATOMS:
Quantum Nos. of light atoms, the atom shell model. Fine splitting of levels of light atoms, periodic system of elements and atoms with valent s-electrons, the structure of heavy atoms – atoms with valent d – and f – electrons, exchange interaction in heavy atoms, filing of electron shells for jj-coupling.

EXCITED ATOMS:
Metastable and resonantly excited atoms, metastable atoms in gas discharge and gas lasers, properties of highly excited atoms.

REFERENCE BOOKS:

1. Physics of Atoms & Ions
   Richard L. Liboff, Borns M. Smirnov, Springer

2. Introduction to Quantum Mechanics
   Linus Pauling, E. Brignt Wilson Corrier , Dover Publication

3. Elementary Atomic Structure
   Woodgate, Oxford Uni. Press

M. TECH 1st SEMESTER NANOTECHNOLOGY

INTRODUCTION TO MATERIALS : Ph NT-111

L	T			
4	0	CREDITS		:4
		END SEMESTER EXAM MARKS		:50
		SESSIONAL MARKS		:50
		EXAMINATION DURATION(HOURS)		:3

INTRODUCTION TO MATERIALS:
Science and Engineering-Materials resources and their implications, materials and engineering, engineering materials and selected application, special nanomaterials carbon fullerences, carbon nanotubes, micro and mesoporous structures.

ELECTRONS, ATOMS AND SOLIDS:
Introduction, atomic electrons in single atoms, electrons in molecules and solids, bonding in solids.

STRUCTURE OF SOLIDS:
Introduction, to crystal structure, common crystal structure – experimental evidence for crystal structure, defects in crystalline solids, structural morphologies and their revelation.

POLYMERS, GLASSES, CERAMICS, CARBON-MATRIX COMPOSITES AND NON-METALLIC MIXTURES:
Introduction, Polymers and their chemistry structure and morphology, inorganic glasses ceramics – structure, carbon matrix composites, carbon and graphite, self-sensing carbon fiber polymer matrix composites.

KINETICS OF MASS TRANSPORT AND PHASE TRANSFORMATION:
Introduction, macroscopic diffusion phenomena, atomic movements in diffusion, nucleation, kinetics of phase transformatics, generalized solid-state kinetics.

ELECTRICAL, MAGNETIC AND OPTICAL PROPERTIES OF MATERIALS:
Brief introduction to electrical, magnetic and optical properties.

REFERENCE BOOKS:
1. Engineering Materials Science
    Mittas Obring , Elsevier
2. An introduction to Materials Engineering and Science For Chemical and Materials Engineering
    Brian S. Mitchell Wiley - IEEE
3. Applied Materials Science
    Deborah D L Chung ,CRC Press.
4. Nano-structures and Nano-materials Synthesis Properties & Application
    G. Gao ,Imp. College Press.

M. TECH 1st SEMESTER NANOTECHNOLOGY

PHOTONICS: PhNT-113

L	T		CREDITS	:4
4	0		END SEMESTER EXAM MARKS	:50
			SESSIONAL MARKS	:50
			EXAMINATION DURATION(HOURS)	:3

INTRODUCTION:
Electronics & Photonics – a brief history, future outlook of photonics.

PHOTONICS & INTERACTIONS:
Quantum optics, interactions of photons atoms, interaction of light with light, Non-linear optics, second-order non-linearity, third order non-linearity, non-linear crystals, interaction of light and sound.

RECENT ADVANCES IN SEMI-CONDUCTOR AND TECHNOLOGY:
Introduction, Review of semiconductor lasers, quantum wire and quantum box, wavelength tuning in quantum well lasers.

FIBER LASERS:
Introduction, Operating principle of Fiber lasers, resonant cavity for a fiber oscillator, typical fiber lasers, pump source requirements for end-pumped lasers, mode locking in fiber lasers, mode locking methods, high power fiber lasers, Diode laser pumping.

SOLID STATE LASERS AND OTHER LASER SOURCES:
Introduction, Fundamental concepts of solid-state lasers, tunable lasers, ultra-fast solid state lasers, gaseous discharge lasers dye lasers, excimer, free electrons, X-ray and extreme-UV lasers.

NANO-PHOTONICS:
Introduction, Foundations for nano-photonics, Plasmonics, photonic, crystals nano-photonics for biotechnology and nanomedicine.

REFERENCE BOOKS:

1. Advanced photonics
   Chai Yeh ,Elsevier.
2. Hand book of Photonics
   Mool C.Gupta ,CRC Press.
3. Photonics Essentials
   Thomas P. Pearsall ,McGraw-Hill
4. Nano-photonics
   Paras N Prasad , Wiley – IEEE

SECOND SEMESTER

Course No.	Title	Schedule of Teaching				Credit Point
		Lecturer	Tutorial	Practical	Total	
PhNT-202	Experimental Methods in Nanotechnology	4	--	--	4	4
PhNT-204	Characterization tools for nanomaterials	4	--	--	4	4
PhNT-206	Micro Electro Mechanical Systems (MEMS) & Nano Electro Mechanical Systems(NEMS)	4	--	--	4	4
	*Elective	4	--	--	4	4
PhNTL-202	Lab2:Materials' Characterization Lab	--	--	8	4	4
	Total	16	--	8	20	20

*Electives:
PhNT-208:Nano- lithography (E)
PhNT-210:Nanoelectronics and Devices (E)
PhNT-212:Molecular Self- Assembly (E)

Weightage:

For Theory Courses : During Semester Evaluation Weightage = 50%
End Semester Examination Weightage = 50%

For Laboratory Courses : During Semester Evaluation Weightage = 60%
End Semester Examination Weightage = 40%

M.TECH. 2nd SEMESTER NANOTECHNOLOGY

EXPERIMENTAL METHODS IN NANOTECHNOLOGY: PhNT-202

L	T
4	0

CREDITS	:4
END SEMESTER EXAM MARKS	:50
SESSIONAL MARKS	:50
EXAMINATION DURATION(HOURS)	:3

INTRODUCTION:
Review of various experimental techniques used in synthesis, fabrication, and characterization of nano-materials and devices.

EXPERIMENTAL METHODS FOR FABRICATION:
Semiconductor processing techniques- Cleaning, etching, oxidation, Gettering, Doping, Epitaxy; Lithography-Photolithography, Electron beam lithography, X-Ray lithography, Focused Ion Beam Lithography (FIB); Soft Lithography- Micro-contact Printing, Molding, Nanoimprint, Dip-Pen Nanolithography, AFM based Nanolithography ;Experimental techniques used in synthesis of Carbon nanotubes-Arc Discharge, Laser Furnace, Chemical Vapor Deposition(CVD);Template Synthesis.; Self Assembly and Bio/Chemical Methods

EXPERIMENTAL TECHNIQUES FOR CHARACTERIZATION:
Structural Characterization- X-Ray Diffraction (XRD); Small Angle X-Ray Scattering (SAXS), Scanning Electron Microscopy; Optical Spectroscopy; Raman Spectrometery.

REFERENCE BOOKS:

1. Nanostructures and Nanomaterials-Synthesis, Properties and Applications
   Guozhong Cao,Imperial College Press.

2. Nanotechnology-An Introduction to Nanostructuring Techniques
   Michael Kohler,Wolfgang Fritzsche,Wiley-VCH

3. Microfabrication and Nanomanufacturing
   Mark J (ed)Jackson,Taylor and Francis

4. Carbon Nanotubes:Science and Applications
   Laurie Kelly, Meyyappan Meyyappen,CRC Press

M.TECH. 2nd SEMESTER NANOTECHNOLOGY

CHARACTERIZATION TOOLS FOR NANOMATERIALS: PhNT-204

L	T		CREDITS	:4
4	0		END SEMESTER EXAM MARKS	:50
			SESSIONAL MARKS	:50
			EXAMINATION DURATION(HOURS)	:3

INTRODUCTION:
Need for characterization, Challenges, Brief review of various Characterization tools.

STRUCTURAL CHARACTERIZATION TOOLS:
Introduction, X-ray Diffraction; Small Angle X-ray Scattering (SAXS); Scanning Electron Microscopy (SEM); Transmission Electron Microscopy(TEM); Scanning Tunneling Microscopy(STM),Atomic Force Microscopy(AFM)-Scanning Probe Microscopy (SPM).

CHEMICAL CHARACTERIZATION:
Introduction, Optical Spectroscopy-Absorption and Transmission Spectroscopy; Photoluminescence(PL); Infrared Spectroscopy; Raman Spectroscopy; Electron Spectroscopy; Ionic Spectroscopy-Rutherford Back Scattering Spectrometry(RBS);Secondary Ion Mass Spectrometry(SIMS)

CAPABILITIES AND LIMITATIONS OF TECHNIQUES:
Elemental sensitivity, Detection Limit, Lateral Resolution, Effective probing depth

REFERENCE BOOKS:

1. Nanostructures and Nanomaterials-Synthesis, Properties and Applications
   Guozhong Cao,Imperial College Press

2. Handbook of Nanophase and Nanomaterials(Vol 1 and II)
   Zhong Lin Wang,Springer

3. Encyclopedia of Materials Characterization
   C.R.Brundle,C.A.Evans Jr.,and S.Wilson(eds),Butterworth-Heinemann,Stoneham,Ma

4. Surface Analysis:The Principal Techniques
   J.C.Vickerman,John Wiley and Sons

5. Scanning Probe Microscopy and Spectroscopy: Methods and Applications
   Roland Wiesendanger,Cambridge Univ Press

M. TECH 2nd SEMESTER NANOTECHNOLOGY

MICRO-ELECTRO MECHANICAL SYSTEM (MEMS) & NANO-ELECTRO MECHANICAL SYSTEMS (NEMS): Ph NT-206

L	T			
4	0			

CREDITS	:4
END SEMESTER EXAM MARKS	:50
SESSIONAL MARKS	:50
EXAMINATION DURATION(HOURS)	:3

NANO-AND MICROSCIENCE, ENGINEERING AND TECHNOLOGY:
Introduction and overview, MEMS and NEMS definitions, Toxonamy of Nano-and Microsystems- Synthesis and Design.

NANO-AND MICRO SYSTEMS:
Classification and considerations, Biomimetics, Biological analogies, and design–Biomimetics Fundamentals, Biomimetics for NEMS and MEMS, Nano-ICs and Nanocomputer architectures, Biomimetics and nervous systems.

MODELING OF MICRO-AND NANOSCALE ELECTROMECHANICAL SYSTEMS:
Introduction to modeling, analysis and simulation, basic electro-magnetic with application to MEMS and NEMS, modeling developments of micro-and nanoactuators using electromagnetic-Lumped-parameter mathematical models of MEMS, energy conversion in NEMS and MEMS.

SYNTHESIS, DESIGN AND FABRICATION OF MEMS:
Introduction, Microfabrication of microcoils / windings through copper, nickel and aluminium electro deposition, micromachined polymer magnets, axial electromagnetic micromotors, micromachined polycrystalline SiC microimotors.

REFERENCE BOOKS:
1. Micro-Electro Mechanical and Nano-Electro Mechanical Systems, Fundamental of Nano-and Micro-Engineering
   Sergey Edward Lyshevski, Lyshevski Edward Lyshevski,CRC Press
2. Nanomaterials:Synthesis,Properties and Applications
   A.S.Edelstein and R.C.Cammarata(edits),Institute of Physics

3. Micro-Electro Mechanical and Nano-Electro Mechanical Systems
   Sergy Edward Lyshevski,CRC Press

M.TECH. 2nd SEMESTER NANOTECHNOLOGY

NANO- LITHOGRAPHY: PhNT-208

L	T		CREDITS	:4
4	0		END SEMESTER EXAM MARKS	:50
			SESSIONAL MARKS	:50
			EXAMINATION	:3
			DURATION(HOURS)	

INTRODUCTION:
Nanofabrication-Tools and Processes; Resists-Resists as Templates, Resists as Etch Masks, Self-Assembly Monolayer (SAM) Resists

LITHOGRAPHY:
Photolithography Principles; Phase Shifting Optical Lithography; Electron Beam Lithography (EBL);Neutral Atomic Beam Lithography; Ion-Beam Lithography(IBL); X-ray   Lithography(XRL); Proximal Probe Lithography-The technique, Proximal Probes, STM based Electron-Beam Lithography

PATTERN TRANSFER PROCESS:
Techniques: Metal gates or wires by evaporation and lift-off; Dry Etching Processes-Reactive Ion Etching(RIE);Electron Cyclotron Resonance(ECR) Reactive Ion etching; Chemically Assisted Ion-Beam (CAIBE) Etching and Reaction Ion-Beam Etching (RIBE)

NANOMANIPULATION AND NANOLITHOGRAPHY:
STM based nanomanipulation and fabrication; AFM based techniques ;Field Evaporation or Field Desorption technique for nanolithography; Soft Lithography

REFERENCE BOOKS:
1. Nanomaterials:Synthesis,Properties and Applications
   A.S.Edelstein and R.C.Cammarata(edits),Institute of Physics

2. Nanostructures and Nanomaterials-Synthesis, Properties and Applications
   Guozhong Cao,Imperial College Press

3. Nanolithography
   M.Gentii et al.(edits),Springer

M.TECH. 2nd SEMESTER NANOTECHNOLOGY

NANOELECTRONICS AND DEVICES: PhNT-210

L	T
4	0

CREDITS	:4
END SEMESTER EXAM MARKS	:50
SESSIONAL MARKS	:50
EXAMINATION DURATION(HOURS)	:3

INTRODUCTION:
Moore's Law and its significance; Quantum Effects as limitation to the Miniaturization; Nanoelectronics and its development; Strategies for fabrication of nano devices; Development of Electronics-Semiconductor Transistors; Some tools of Micro-and Nanofabrication.

QUANTUM ELECTRONIC DEVICES:
High Electron Mobility Transistors;Quantum Interference Transistors; Carbon Nanotube Transistors;Quantum Corrals in Electronics

MOLECULAR ELECTRONICS:
Introduction.DNA Directed Assembly and application in Electronics; Quantum Information and Quantum Computers;Difference between Quantum Computer and Classical Computer; Working of a Quantum Computer; Decoherence; Experimental Implementation of Quantum Computers.

SPECIAL DEVICES:
Quantum Dot Devices;Resonant Tunneling Devices(RTDs);Electron Wavefunction Effect Devices;Single Electron Effect Devices;Nanotransistors-Vertical Transport Nanotransistor Designs; Lateral Transport Nanotransistor Designs;Carbon Nanotube Sensors and devices,Nano Motors

REFERENCE BOOKS:
1. Nanotechnology-Basic Science and Emerging Technologies
   Mick Wilson et al,Overseas Press

2. Carbon Nanotubes:Science and Applications
   Laurie Kelly, Meyyappan Meyyappen,CRC Press

3. Nanomaterials:Synthesis,Properties and Applications
   A.S.Edelstein and R.C.Cammarata(edits),Institute of Physics

4. Molecular Electronic Devices
   F.L.Carter et al(Ed);New York North Holland

M.TECH. 2ᴺᴰ SEMESTER NANOTECHNOLOGY

MOLECULAR SELF-ASSEMBLY: PhNT-212

L	T
4	0

CREDITS	:4
END SEMESTER EXAM MARKS	:50
SESSIONAL MARKS	:50
EXAMINATION DURATION(HOURS)	:3

INTRODUCTION:
What is self-assembling process? Examples of directed and Controlled Self-Assembly; Nanotechnology and Self-Assembly; Intermolecular interactions, Molecular mobility, Process Medium; Factors responsible for self-assembly

MOLECULAR BUILDING BLOCKS(MBBs):
What are MBBs;Top-down and Bottom-Up approaches; Nanotechnology Molecular Building Blocks; Concept of Diamondoids and their applications as MBBs.

SELF-ASSEMBLY TECHNIQUES:
Self-Assembly using Solid-Surfaces-Immobilization techniques; Affinity Coupling via Antibodies; Affinity Coupling by Biotin-Streptavidin (Bio-STV) System and its Modification; Immobilized Metal Ion Complexation (IMIC); Self-Assembled Monolayer(SAM) and its examples; Strain Directed Self-Assembly; DNA Directed Self-Assembly; Self-Assembly on Silicon Surfaces.

SELF-ASSEMBLY IN FLUID MEDIA:
Generic Principle of fluidic self-assembly using a template surface; Dynamic Combinational Chemistry; Design of Molecular Cages

REFERENCE BOOKS:
1. Principles of Nanotechnology
   G.Ali Mansoori,World Scientific

2. Nanomaterials:Synthesis,Properties and Applications
   A.S.Edelstein and R.C.Cammarata(edits),Institute of Physics

3. Nanostructures and Nanomaterials-Synthesis, Properties and Applications
   Cao,Imperial College Press

4. Self-Assembly
   Brian Robinson,IOS Press

Tabled   **To consider starting of an M.Tech. course in VLSI Design in**
Item 8.20   **Electronics & Communication Engineering Department.**

Our Institute has been selected for participation in phase-II of the project Special Manpower Development Programme in VLSI Design of the Department of Information Technology. The central objective of the project is to generate trained and high quality manpower in VLSI Design area in next five years to make a high-end VLSI Design destination.

As one of the measure to achieve the above goal our Institute have to start the M.Tech. Course in VLSI design. The necessary funds will be provided by the Department of Information Technology. The model scheme & syllabi as provided by the DIT and approved by the BOS of Electronics & Communication Engineering Department is enclosed as **Appendix-IX (Page 93 to 117).**

In addition to above, the BOS of ECE Department in its meeting held on 22.09.2006 has considered and approved to retrofit the B.Tech. & M.Tech. Courses. The details of the same is enclosed as **Appendix-X (Page 118)** for the information of the Senate.

The Senate may consider and decide to start M.Tech. Course at NIT, Kurukshetra from the Academic Session 2007-2008 with an intake of 10 students for two years out of the funds provided by the DIT.

Scheme and Syllabi

for proposed

M.Tech. (VLSI Design)

under

Project SMDP-II

NATIONAL INSTITUTE OF TECHNOLOGY
KURUKSHETRA
(DEEMED UNIVERSITY)

Scheme for M.Tech (VLSI Design)

First Semester:

Sl. No.	Course No.	Subject	L-T-P	Credits
1	ECVLSI-101	Digital IC Design	3-1-0	3.5
2	ECVLSI-103	Analog IC Design	3-1-0	3.5
3	ECVLSI-105	Hardware Description Languages and FPGA based Design	3-1-0	3.5
4	ECVLSI-107	Modeling of Semiconductor Devices	3-1-0	3.5
5	MTEC-101	Mathematical Models for Internet	3-1-0	3.5
6	ECVLSI-109	Digital design Lab	0-0-3	1.5
7	ECVLSI-111	Analog Design Lab	0-0-3	1.5

Total Credits = 20.5

Second Semester:

Sl. No.	Course No.	Subject	L-T-P	Credits
1	ECVLSI-104	Embedded System Design	3-1-0	3.5
2	ECVLSI-106	DSP and ASIP Architectures	3-1-0	3.5
3		Elective-I	3-1-0	3.5
4		Elective-II	3-1-0	3.5
5	ECVLSI-108	Advance Design Lab-I	0-0-4	2
6	ECVLSI-110	Advance Design Lab-II	0-0-4	2

Total Credits = 18

Third Semester:

Sl. No.	Course No.	Subject	L-T-P	Credits
1	ECVLSI-201	Research Methodology	3-1-0	3.5
2	ECVLSI-203	Seminar	0-2-0	1
3		Elective-III	3-1-0	3.5
4	MTEC-301	Security Engineering	3-1-0	3.5
5	ECVLSI-D	Dissertation	0-0-10	10

Total Credits = 21.5

Fourth Semester:

Sl. No.	Course No.	Subject	L-T-P	Credits
1	ECVLSI-D	Dissertation-(continued)	0-0-0	S/US

Total Credits = 20

List of Electives

Sl. No.	Course No.	Subject	L-T-P	Credits
		ELECTIVE-I		
1	ECVLSI-112	Integrated Electronic System Design	3-1-0	3.5
2	ECVLSI-114	Low-Power VLSI Design	3-1-0	3.5
3	ECVLSI-116	Nano-Technology	3-1-0	3.5
		ELECTIVE-II		
4	ECVLSI-118	RF Microelectronics	3-1-0	3.5
5	ECVLSI -120	Mixed Signal IC Design	3-1-0	3.5
6	MTEC-205	Multimedia Systems	3-1-0	3.5
		ELECTIVE-III		
7	ECVLSI -205	Memory Design and Testing	3-1-0	3.5
8	ECVLSI -207	Advance Digital Signal Processing	3-1-0	3.5
9	MTEC-306	CDMA Systems	3-1-0	3.5

M. Tech. First Semester
Digital IC Design
(ECVLSI-101)

L T P
3 1 0

- Modeling of Interconnects, CMOS Inverter: Static and Dynamic Behavior, Power, Energy and Energy Delay, Scaling.
- Design of CMOS Combinational Logic Gates.
- Design of CMOS Sequential Logic Circuits.
- Custom, Semi-custom, and Structured array design approaches: Cell based Design, array based design.
- Interconnect Parasitics.
- Timing issues in Digital Circuits.
- Design of ALU- a case study

TEXT BOOKS:

1. J. M. Rabaey, A. P. Chandrakasan and B. Nikolic, *Digital Integrated Circuits : A Design Perspective*, Second Edition, PH/Pearson, 2003.

REFERENCE BOOKS:

2. S. M. Kang and Y. Leblebici, *CMOS Digital Integrated Circuits : Analysis and Design*, Third Edition, MH, 2002.
3. N. Weste, K. Eshraghian and M. J. S. Smith, *Principles of CMOS VLSI Design : A Systems Perspective*, Second Edition (Expanded), AW/Pearson, 2001.
4. J. P. Uyemura, *Introduction to VLSI Circuits and System*, Wiley, 2002.
5. R. J. Baker, H. W. Li and D. E. Boyce, *CMOS Circuit Design, Layout and Simulation*, PH, 1997.

M. Tech. First Semester
Analog IC Design
(ECVLSI-103)

L T P
3 1 0

- MOSFET based single stage, Differential amplifiers. Current Mirrors. Frequency response of amplifiers. Sources of Noise in MOS amplifiers.
- CMOS Band gap References, Comparators.
- Feedback in Amplifiers, CMOS Operational Amplifiers.
- Switched Capacitor Filters: Filter Circuits. CMOS AD Converters, Modulators, and Detectors.
- CMOS Phase Lacked Loops.

TEXT BOOKS:

1. B. Razavi, *Design of Analog CMOS Integrated Circuits*, MH, 2001.

REFERENCE BOOKS:

2. P. E. Allen and D. R. Holberg, *CMOS Analog Circuit Design*, Second Edition, OUP, 2002.
3. R. Gregorian, *Introduction to CMOS Op-Amps and Comparators*, Wiley, 1999.
4. K. R. Laker and W. M. C. Sansen, *Design of Analog ICs and Systems*, MH, 1994.

M. Tech. First Semester
Hardware Description Languages and FPGA Based Design
(ECVLSI-105)

L T P
3 1 0

- Verilog for Behavioural, RTL, Data-flow and Structural Modeling.

- FPGA Architectures and Technology.

- VHDL Synthesis for FPGA Implementation.

- Verilog Synthesis for FPGA Implementation.

TEXT BOOKS:

1 S. Palnitkar, *Verilog HDL : A Guide to Digital Design and Synthesis*, PH/Pearson, 1996
2 K. Coffman, *Real World FPGA Design with Verilog*, PH, 2000

REFERENCE BOOKS:

3. P. J. Ashenden, *The Designer's Guide to VHDL*, Second Edition, Morgan Kaufmann, 2001.
4. C. H. Roth, *Digital System Design with VHDL*, PWS/Brookscole, 1998.
5. R. C. Seals and G. F. Whapshott, *Programmable Logic : PLDs and FPGAs*, MH, 1998.
6. A.K. Sharma, *Programmable Logic Handbook : PLDs, CPLDs and FPGAs*, MH, 1998.

Modeling of Semiconductor Devices
(ECVLSI-107)

L T P
3 1 0

- Brief review of silicon devices & fabrication processes, Recent developments in microelectronic devices.
- DC and small signal models for the devices. Low frequency and high frequency equivalent circuits. Secondary effects in devices.
- SPICE models of p-n junctions, BJTs, MOSFETs, including BSIM models.
- Modeling for circuit simulation.

TEXT BOOKS:

1. N. Dasgupta and A. Dasgupta, *Semiconductor Devices: Modeling and Technology*, PHI (2004).
2. Y.Tsividis, *Operation and Modeling of The MOS Transistor*, OUP (2004).

REFERENCE BOOKS:

3. M. S. Tyagi, *Introduction to Semiconductor Materials and Devices*, Wiley, 1991.
4. M. Shur, *Physics of Semiconductor Devices*, PH, 1990.
5. D. Foty, *MOSFET Modeling with SPICE : Principles and Practices*, PH, 1997.
6. B. G. Streetman, *Solid State Electronic Devices*, Fourth Edition, PH, 1995.
7. R. Raghuram, *Computer Simulation for Electronic Circuits*, Wiley, 1989.
8. W. Liu, *MOSFET Models for SPICE Including BSIM3v3 and BSIM4*, Wiley, 2001

M. Tech. First Semester
Mathematical Models for Internet
(MTEC-101)

L T P
3 1 0

UNIT 1 : Mathematical Background and Basic WWW Technologies

Probability and Learning from a Bayesian Perspective, Parameter Estimation from Data. Mixture Models and the Expectation Maximization Algorithm, Graphical Models. Classification, Clustering Power-Law Distributions/Web Documents, Resource Identifiers: URI, URL, and URN Protocols, Log Files, Search Engines.

UNIT 2 : Web Graphs and Text Analysis

Internet and Web Graphs, Indexing, Lexical Processing, Content-Based Ranking. Probabilistic Retrieval, Exploiting Hyperlinks, Document Clustering, Information Extraction.

UNIT 3: Link Analysis and Crawling Techniques

Early Approaches to Link Analysis, Nonnegative Matrices and Dominant Eigenvectors. Hubs and Authorities: HITS. PageRank, Stability, Probabilistic Link Analysis, Limitations of Link Analysis, Selective Crawling. Focused Crawling. Distributed Crawling, Web Dynamics.

UNIT 4 : Human Behavior and Commerce on the Web

Web Data and Measurement Issues, Empirical Client-Side Studies of Browsing Behavior, Probabilistic Models of Browsing behavior, Modeling and Understanding Search Engine Querying, Customer Data on the Web, Automated Recommended Systems, Networks and Recommendations.

TEXT BOOK:

1. Modeling the Internet and the Web : Probabilistic Methods and Algorithms Pierre Baldi, Paolo Frasconi, Padhraic Smyth, (Wiley).

M. Tech. First Semester
Digital Design Lab
(ECVLSI-109)

L T P
0 0 3

Laboratory Experiments:

Laboratory experiments will be based on the contents of the theory courses ECVLSI-101 and ECVLSI-105

M. Tech. First Semester
Analog Design Lab
(ECVLSI-111)

L T P
0 0 3

Laboratory Experiments:

Laboratory experiments will be based on the contents of the theory courses ECVLSI-103
and ECVLSI-107.

M. Tech.Second Semester
Embedded System Design
(ECVLSI-104)

L T P
3 1 0

- Introduction to Embedded Systems and Architectures.

- Hardware/Software Partitioning, Design Considerations and Trade-offs.

- Processors and Memories.

- Interfaces and Communication Mediums; Timers and Counters.

- Programming an Embedded System.

- Examples and Case Studies.

TEXT BOOKS:

1. W. Wolf, *Computers as Components : Principles of Embedded Computer Systems Design*, Morgan Kaufmann, 2000.
2. F. Vahid and T. D. Givargis, *Embedded System Design : A Unified Hardware/Software Introduction*, Wiley, 2002.

REFERENCE BOOKS:

3 S. Heath, *Embedded Systems Design*, Second Edition, Butterworth-Heinemann, 2002.
4 J. Catsoulis, *Designing Embedded Hardware*, ORA, 2002.
5 J. J. Labrosse, *Embedded Systems Building Blocks*, CMP Books, 1999.
6 G. De Micheli, R. Ernst and W. Wolf, *Readings in Hardware/Software Codesign*, Morgan Kaufmann, 2001.

M. Tech.Second Semester
DSP and ASIP Architectures
(ECVLSI-106)

L T P
3 1 0

1. Implementations of Basic DSP Operations (Adders, Multipliers, Dividers), Discrete Fourier Transform Implementation; Fixed-Point versus Floating-Point Operations; Pipelining and Parallelism; Re-timing, Unfolding, and Folding.

2. Systolic/Array Architectures; Programmable DSP Architectures; Memory Structures and Addressing.

3. Implementation of FIR and IIR Filter Structures.

4. ASIP Related Terms; Power/Energy/Performance Issues; ASIP Design Space; ASIP Design Flow; Hardware-Software Boundary and Trade-offs; Case Studies.

TEXT BOOKS:

1. P. Lapsley, J. Bier, A. Shoham and E. A. Lee, *DSP Processor Fundamentals : Architectures and Features*, Wiley/IEEE, 2001.
2. P. Pirsch, *Architectures for Digital Signal Processing*, Wiley, 1998.
3. T. Glokler and H. Meyr, *Design of Energy-Efficient Application Specific Instruction Set Processors*, Kluwer, 2004.

REFERENCE BOOKS:

1. K. K. Parhi, *VLSI Digital Signal Processing Systems : Design and Implementation*, Wiley, 1999.
2. V. K. Madisetti, *VLSI Digital Signal Processors*, Butterworth-Heinemann/IEEE Press, 1995.
3. A. Bateman and I. Paterson-Stephens, *The DSP Handbook*, PH/Pearson, 2002.
4. S. M. Kuo, *Digital Signal Processors : Architectures, Implementations and Applications*, PH/Pearson, 2004.
5. L. Wanhammar, *DSP Integrated Circuits*, AP, 1999.
6. B. Venkataramani and M. Bhaskar, *Digital Signal Processors : Architecture, Programming and Applications*, TMH, 2002.
7. E. E. Swartzlander, *Application Specific Processors*, Kluwer, 1997.
8. U. Meyer-Baese, *DSP with FPGAs*, Springer-Verlag, 2001.

M. Tech. Second Semester
Advance Design Lab-I
(ECVLSI-108)

L T P
0 0 4

Laboratory Experiments:

Laboratory experiments will be based on the contents of the theory courses ECVLSI-104 and ECVLSI-106.

M. Tech. Second Semester
Advance Design Lab-II
(ECVLSI-110)

L T P
0 0 4

Laboratory Experiments:

Laboratory experiments will be based on the contents of the theory courses Elective-I and Elective-II.

M. Tech. Third Semester
Research Methodology
(ECVLSI-201)

L T P
3 1 0

Methods of scientific research: Qualitative research, Quantitative research, Desk research Research as an Engineering pursuit

Data collection methods, approaches to data collection, data collection tools, interpretation of statistical analysis

On-line literature searching and document retrieval

Outline of problem solving, creative thinking, theory and practice, creative- thinking techniques

Scheduling, organization and procrastination, keeping a schedule, tools of time management: rules of time management, setting assessing and achieving goals

Review of techniques for managing stress, Oral communication: voice production, performance anxiety, informative speech, audio- visual materials, ethics in research.

Writing a research proposal and research paper

Reference:

1. Anthony M. Graziano, Michael L. Raulin, "Rsearch Methods", Amazon.com

M. Tech. Third Semester
Security Engineering
(MTEC-301)

L T P
3 1 0

Unit- 1 : Introduction

General security concepts, basic terminologies, issues, computer network and security models.

Symmetric and asymmetric cryptography, public key cryptography, data encryption standard (DES), international data encryption algorithm (IDEA), advanced encryption standard (AES), algorithms for hashes and message digests.

Unit- 2: Authentication, Access Control and security standards

Authentication, authentication schemes, their strength and weakness, control of accesse to information resources, access control models.

Security standards and protocols, Kerberos protocol: public key infrastructure (PKI); security protocols for different network layers, secure IP protocol (Ipsec), Secure Socket Layer (SSL) and transport layer security (TLS), Protocols for E-Commerce.

Unit -3 : Web and Email Security

Important security issues with the Web (both the server and the client sides), building and maintaining secure web sites.

Risks and issues associated with the uses of electronic email, privacy, message integrity and authenticity, technologies for secure email systems, PEM (Privacy Enhanced Email), S/MIME, PGP secure mail protocol.

Unit-4: Security Systems and Management Issues

Security systems in the real world, firewalls, security in software systems, main security features of some well-known systems and their weaknesses.

Security policies, management strategies and policies for enterprise information security, management issues relevant to information security.

TEXT BOOKS:

1. Charlie Kaufman, Radia Perlman, Mike Specineer: Network Security – private communication in a public world, second edition, Prentice Hall, 2002.
2. Newman, Robert C: Enterprise Security, 2003/1st Ed., Prentice Hall.

Programmme Elective
Integrated Electronic System Design
(ECVLSI-112)

L T P
3 1 0

1. Electronic Systems; Sensors and Actuators; Microcomputers and Micro-controllers.

2. Packaging of Digital Systems : ICs, PCBs, Chassis and Cabinets, Back-planes and Motherboards, Wires and Cables, Connectors.

3. Noise in Digital Systems; Clocking and Timing Issues.

4. Bus-based System Design.

5. System Design Using i8051 Micro-controller (or 68HC12 Micro-controller).

6. Real-time System Design Issues.

TEXT BOOKS

1. W. J. Dally and J. W. Poulton, *Digital Systems Engineering*, CUP, 1998.
2. N. Storey, *Electronics : A Systems Approach*, AW/Pearson, 1998/2000.
3. S. D. Burd, *Systems Architecture*, Thomson, 2001.

REFERENCE BOOKS:

2. G. Lipovski, *Introduction to Micro-controllers (MC 68HC12)*, AP, 1999.
3. G. Lipovski, *Single and Multi-Chip Micro-controller Interfacing (MC 68HC12)*, AP, 1999.
4. F. M. Cady, *Microcontrollers and Microcomputers : Principles of Software and Hardware Engineering*, OUP, 1997.

5. *M. Predko*, Handbook of Microcontrollers, *MH, 1998.*

Programmme Elective
Low-Power VLSI Design
(ECVLSI-114)

L T P
3 1 0

1. Introduction: Sources of power dissipation, Important parameters for low power design, Low power design approaches.
2. Transistor sizing vs. dissipation and speed, effect of scaling.
3. Low power circuit techniques, energy recovery CMOS.
4. Low power clock distribution.
5. Logic synthesis for low power.
6. Design of low power arithmetic and memory elements.

TEXT BOOKS:

1. J. M. Rabaey, M.Pedram, *Low Power Design Methodologies,* Kluwer-Academic Publn.(2002).

REFERENCE BOOKS:

2. J. M. Rabaey, A. P. Chandrakasan and B. Nikolic, *Digital Integrated Circuits : A Design Perspective,* Second Edition, PH/Pearson, 2003.
3. K. Roy and S. C. Prasad, *Low-Power CMOS VLSI Circuit Design,* Wiley, 2000.
4 A. P. Chandrakasan and R. W. Brodersen, *Low Power Digital CMOS Design,* Kluwer, 1995.
5 A. P. Chandrakasan and R. W. Broderson, *Low-Power CMOS Design,* IEEE Press, 1998.
6 E. Sanchez-Sinencio and A. G. Andreou, *Low-Voltage/Low-Power Integrated Circuits and Systems : Low-Voltage Mixed Signal Circuits,* IEEE Press, 1999.

Programmme Elective
Nano Technology
(ECVLSI-116)

L T P
3 1 0

Introduction to nanoscale systems. Length, energy, and time scales

Top-down approach to nanolithography. Spatial resolution of optical, deep-ultraviolet, x-ray, electron beam, and ion beam lithography.

Single electron transistors, coulomb blockade effects in ultra-small metallic tunnel junctions.

Quantum confinement of electrons in semiconductor nanostructures: two-dimensional confinement (quantum wells). Band gap engineering. Eptaxy.

Landauer-Buttiker formalism for conduction in confined geometries.

One dimensional confinement: Quangum point contacts, quantum dots.

Bottom-up approach. Chemical self-assembly, carbon nanotubes.

Molecular electronics. Self-assembled monolayers. Electrochemical techniques; applications in biological and chemical detection.

Atomic scale characterization techniques: scanning tunneling microscopy, atomic force microscopy.

Introduction to quantum methods of information processing.

TEXT BOOKS:

1. David Ferry, Transport in Nanostructures, Cambridge University Press, 2000.
2. Y. Imry, Introduction to Mesoscopic Physics, Oxform university Press, 1997.
3. S. Datta, Electron Transport in Mesoscopic Systems, Cambridge University Press, 1995
4. H. Grabert and M. Devoret, Single Charge Tunneling, Plenum Press, 1992.
5. Beenaker and Van Houten, Quantum Transport in Semiconductor Nanostructures, in Solid State Physics v. 44, eds. Ehernreich and Turnbull, Academic Press, 1991.
6. P. Rai-Choudhury, Handbook of Microlithography, Micromachining & Microfabrication, SPIE, 1997.

Programmme Elective
RF Microelectronics
(ECVLSI-118)

L T P
3 1 0

- Active RF Components and their characteristic parameters
- RF Filter Design.
- High-Frequency Amplifier Design.
- Noise in RF Circuits; Low-Noise Amplifier (LNA) Design; RF Power Amplifier Design.
- Phase-Locked Loops (PLLs); RF Oscillator Design; RF Resonators and Mixers.
- RF amplifier design – a case study

TEXT BOOKS:

1. T. H. Lee, *The Design of CMOS Radio Frequency Integrated Circuits*, CUP, 1998.
2. R. Ludwig and P. Bretchko, *RF Circuit Design*, Pearson, 2000.
3. B. Razavi, *RF Microelectronics*, PH, 1998.

REFERENCE BOOKS:

1. B. Leung, *VLSI for Wireless Communication*, PH, 2002.
2. B. Razavi, *Phase-Locking in High-Performance Systems*, Wiley/IEEE, 2003.
3. B. Razavi, *Monolithic Phase-Locked Loops and Clock Recovery Circuits*, IEEE Press, 1996.
4. R. E. Best, *Phase-Locked Loops : Design, Simulation and Applications*, Fifth Edition, MH, 2003.

Programmme Elective
Mixed-Signal IC Design
(ECVLSI-120)

L T P
3 1 0

- Data Converters: Introduction, Characteristic Parameters, DAC and ADC Architectures.
- Sampling and Aliasing, SPICE models for DACs and ADCs, Quantization Noise, Reducing Quantization Noise.
- Data Converter SNR: Clock Jitter, Improving SNR using Averaging, using feedback.
- Noise Shaping data converters: SPICE model, First order noise shaping.
- Implementing data converters.

TEXT BOOK:

1. R. J. Baker, *CMOS Mixed Signal Circuit Design*, Wiley/IEEE, 2002.

REFERENCE BOOKS:

1. A. Handkiewicz, *Mixed-Signal Systems : A Guide to CMOS Circuit Design*, Wiley-IEEE, 2002.
2. B. Razavi, *Principles of Data Conversion System Design*, IEEE Press, 1995.
3. P. V. A. Mohan, V. Ramachandran and M. N. S. Swamy, *Switched Capacitor Filters : Theory, Analysis and Design*, PH, 1995.
4. E. Sanchez-Sinencio and A. G. Andreou, *Low-Voltage/Low-Power Integrated Circuits and Systems : Low-Voltage Mixed-Signal Circuits*, IEEE, 1999.
5. Y. Tsividis, *Mixed Analog-Digital VLSI Devices and Technology*, MH, 1996.
6. S. R. Norsworthy, R. Schreier and G. C. Temes, *Delta-Sigma Data Converters : Theory, Design and Analysis*, IEEE, 1996.
7. V. Peluso, M. Steyaert and W. M. C. Sansen, *Design of Low-Voltage Low-Power CMOS Delta-Sigma A/D Converters*, Kluwer, 1999.
8. S. Rabii and B. A. Wooley, *Design of Low-Voltage Low-Power Sigma-Delta Modulators*, Kluwer, 1998.
9. P. G. A. Jespers, *Integrated Converters : D-A and A-D Architectures, Analysis and Simulation*, OUP, 2001.
10. R. Van de Plassche, *Integrated Analog-to-Digital and Digital-to-Analog Converters*, Kluwer, 1994.

Programmme Elective
Multimedia Systems
(MTEC-205)

L T P
3 1 0

Unit-1, Concept of Multimedia, Emerging Applications, Multimedia Systems and Appliances. Distributed Multimedia Systems, Synchronization, Orchestrtion and QoS Architecture standards.

Unit-2, Digital audio representation and processing – Audio in computer applications, its digital representation, transmission and digital processing, speech recognition and generation.

Digital video and image compression – video compression techniques and standardization of algorithms, JPEG, MPEG, DVI technology.

Unit-3, Multimedia Information Systems – Workstation OS, New OS support, Real Time Mach, Multimedia system service architecture, Media Stream Protocol, service and window system, client control of continuous media, Hyperapplications. Multimedia Information systems, File system support, Data Models.

Unit-4, Multimedia communication systems – public Network services and N/W Protocols, Quick time Movie File (QMF), format, OMFI, MHEG, Format function Real time Interchange, Track Model and Object Model Teleconferencing systems, Shared Amlication Architectures, Embedded Distributed objects. Multimedia conferencing architecture, architecture of team workstation.

Multimedia and Internet. The internet, client server technology, Communication Protocols, Internet Addressing, WWW, HTML, and Web Authoriting, Web page browsers and development, bandwidth and applications considerations, Design Considerations for Web Pages, Accessing content on internet.

Note: Eight questions will be set and the students will be asked to attempt any five questions.

REFERENCE BOOKS:
1. John F. Koegel Bufod: Multimedia Systems, Addison Wesley, Edition.
2. David Hillman: Multimedia Technology and Application, Galgotia Publications

Programmme Elective
Memory Design and Testing
(ECVLSI-205)

L T P
3 1 0

- SRAM and DRAM Cell Design : Basic Structures, Modeling and Design Equations.
- Sense Amplifiers; Voltage and Current Sense Amplifiers; Reference Voltage Generation; Voltage Converters.
- Cache Memory Design.
- Memory Testing; Reliability and Yield; Radiation Effects.
- Memory chip design - a case study

TEXT BOOKS:

1. K. Itoh, *VLSI Memory Chip Design*, Springer-Verlag, 2001.
2. B. Keeth and R. J. Baker, *DRAM Circuit Design : A Tutorial*, Wiley/IEEE, 2000.

REFERENCE BOOKS:

1. B. Prince, *Semiconductor Memories : A Handbook of Design, Manufacture and Application*, Second Edition, Wiley, 1996.
2. B. Prince, *High Performance Memories*, Wiley, 1999.
3. B. Prince, *Emerging Memories : Technologies and Trends*, Kluwer, 2002.
4. A. K. Sharma, *Advanced Semiconductor Memories : Architectures, Designs and Applications*, Wiley/IEEE, 2002.
5. T. P. Haraszti, *CMOS Memory Circuits*, Kluwer, 2000.
6. J. Handy, *The Cache Memory Book*, Second Edition, AP, 1998.
7. M. I. Elmasry, *Digital MOS Circuits II : with Applications to Processors and Memory Design*, IEEE Press, 1992.

Programmme Elective
Advance Digital Signal Processing
(ECVLSI-207)

L T P
3 1 0

- Decimation, Interpolation, Implementation of sampling rate converters, applications of sampling rate converters, polyphase structures, two-channel and M-channel filter banks.

- Innovations representations of stationary random processes, linear prediction, linear prediction filters, Wiener filters, Kalman filters.

- Applications of adaptive filters, adaptive direct form filters, LMS and RLS algorithms, adaptive lattice ladder filters.

- Spectrum estimation from finite duration observations, parametric and nonparametric power spectrum estimation methods, filter bank methods, eigenanalysis algorithms.

TEXT BOOK

1. J.G. Proakis and D. Manolakis Digital signal processing 4th ed. PHI

REFERENCE BOOKS

1. P.P. Vaidyanathan Multirate filter banks PHI/Pearson
2. Simon Haykin Adaptive filter Theory PHI/Pearson 4th ed.

Programmme Elective
CDMA Systems
(MTEC-306)

L T P
3 1 0

Unit 1: Direct sequence and frequency hopped spread spectrum, spreading sequence and their correlation functions, Acquisition and tracking of spread spectrum signals.

Unit 2: Error probability for DS-CDMA, on AWGN channels, DS-CDMA on frequency selective fading channels, Performance analysis of cellular CDMA.

Unit 3: Capacity estimation, Power control, effect of imperfect power control on DS CDMA performance, Soft Handoffs.

Unit 4: Spreading /coding tradeoffs, multicarrier CDMA, IS-95 CDMA system, third generation CDMA systems, multi-user detection.

Note: Eight questions will be set and the students will be asked to attempt any five questions.

REFERENCE BOOKS:

1. Andrew J. Viterbi: CDMA Principles of spread spectrum communications, Addison Wesley
2. J.S. Lee and L.E. Miller: CDMA system Engineering handbook, Artech house

Retrofitting of Courses on Information Security in B.Tech. ECE

B.Tech. VII Semester

Departmental Electives

1. ECT-441   Biometric Security
2. ECT-443   Computer Crime Investigation and Forensics

B.Tech. VIII Semester

1. ECT-408   Cryptography

Retrofitting of Courses on Information Security in M.Tech. ECE

M.Tech. I Semester

1. MTEC-101   Mathematical Models for Internet

M.Tech. III Semester

1. MTEC-301   Security Engineering

In addition to the above, at least one minor project will be carried out in the area of Information Security.

Tabled
Item 8.21

To consider relaxation in the criteria for supervising number of Ph.D. Scholars in a Department.

The Senate in its 4th meeting held on 5.2.2005 while considering the criteria of ceiling of number of Ph.D. Scholars in a Department had decided to fix the following formula on the lines of IIT, Delhi:-

Maximum number of Ph.D. Scholars   =   Total number of
To be registered in a Department   regular faculty x 3.5

Dr. Dinesh Kumar, Chairman, Chemistry Department vide his letter No. CH/648 dated 18.10.2006 duly endorsed by the Director, has requested for relaxation in the criteria of maximum number of Ph.D. Scholars to be registered in a Department. As of now, the Department of Chemistry has already registered 09 number of Research Scholars against existing faculty strength of two. Over and above that the Department had forwarded two more names for registration whose cases had been turned down in light of the above rule.

In view of the existing rules, no more Ph.D. scholar can be permitted to be registered in the Department of Chemistry. However, verbatim Dr. Dinesh Kumar "in order to encourage research in the smaller departments........" criteria may be modified as given below:-

Maximum number of Ph.D. Scholars   =   Total number of **Sanctioned**
To be registered in a Department   regular faculty x 3.5

The request letter as received from Dr. Dinesh Kumar is self explanatory and is enclosed as **Appendix-X (Page 120).**

The Senate may consider, discuss and decide the matter.

DEPARTMENT OF CHEMISTRY
NATIONAL INSTITUTE OF TECHNOLOGY
KURUKSHETRA

No.CH/ 648

Date: 18.10.06

Ph.D. Registration

Kindly refer to the minutes of the agenda item 4.4 (page 24) of the 4th meeting of the Hon'ble Senate regarding the formula to fix the ceiling on each department:

Maximum No. of Ph.D. Scholars to
be registered in a Department.   =   Total No. of regular faculty
x 3.5

In order to encourage research in the smaller departments, like that of mine, where all senior colleagues had undergone superannuation and the regular vacant posts have not been filled up since long back, the above formula may be relaxed as a special case. It is requested that the formula may kindly be modified as given below:

Maximum No. of Ph.D. Scholars to
be registered in a Department.   =   Total No. of sanctioned regular
faculty x 3.5

It is requested that the matter may kindly be placed before the Senate for consideration.

Director

(Dinesh Kumar)
Chairman