NATIONAL INSTITUTE OF TECHNOLOGY MANIPUR

Minutes of the
23rd Senate Meeting

Day: Thursday

Time: 11.00 AM

Date: 25/11/2021

(Via Composite Mode)

<u>MINUTES OF THE 23rd SENATE MEETING HELD ON 25th November, 2021</u>

The 23rd Senate Meeting of National Institute of Technology Manipur was held on 25th November, 2021 at 11.00 AM via Composite Mode.

The following members attended the meeting

❖ Prof. (Dr.) Goutam Sutradhar Director, NIT Manipur	:	Ex-officio Chairman
❖ Prof. Memcha Loitongbam Manipur University	:	Member
❖ Dr. Debasish Bhattacharya NIT Agartala (Via Video Conference)	:	Member
❖ Prof. Chiranjib Bhattacharjee Jadavpur University	:	Member
❖ Dr. Jisnu Basu Saha Institute of Nuclear Physics, Kolkata	:	Distinguished Invitee
❖ Dr. Prabir Kumar Mukhopadhyay Damodar Valley Corporation (Via Video Conference)	:	Distinguished Invitee
❖ Prof. Rajesh Kumar Bhushan Dean (AA), NIT Manipur	:	Member
❖ Dr. Ng. Romeji Singh HoD, Civil, NIT Manipur	:	Member
❖ Dr. Shuma Adhikari HoD, EE, NIT Manipur	:	Member
❖ Dr. Loitongbam Surajkumar Singh HoD (i/c), ECE, NIT Manipur	:	Member
❖ Dr. Kh. Johnson Singh HoD, CSE, NIT Manipur	:	Member
❖ Dr. H. Neeranjan Singh HoD, Mechanical Engg., NIT Manipur	:	Member
❖ Dr. Ch. Barchand Singh HoD, Mathematics Deptt., NIT Manipur	:	Member
❖ Dr. Bibhu Prasad Swain HoD, Physics Deptt., NIT Manipur	:	Member
❖ Dr. Chandi Charan Malakar HoD, Chemistry Deptt., NIT Manipur	:	Member
❖ Dr. Sangeeta Laishram HoD, HSS, NIT Manipur	:	Member
❖ Dr. Th. David Singh Registrar (i/c), NIT Manipur	:	Secretary

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NIT Manipur faculties Listed Among the Top 2% Scientist in the World

Director informed the Senate members that Professor Rajesh Kumar Bhushan and Dr. Bibhu Prasad Swain of the National Institute of Technology Manipur have found a spot in the list that ranked among the top two percent of scientists worldwide released by Stanford University, California, and Elsevier BV, a Netherlands-based publishing company for 2020-21. This database has been prepared by the research group of Dr. Jeroen Baas (Elzevier B.V.), Dr. Kevin Boyack (SciTech Strategies, Inc., USA), and Dr. Jon P.A. Loannidis (Stanford University, USA). The creators of this database have classified top scientists of the world in 22 different fields and 176 subfields. The research group published two different datasets to recognize the top scientists who have made outstanding research contributions in the year 2020 and the international scientists who have done exceptional research work during their careers. The rank is based on the top 1,00,000 by C-scores (number of citations excluding self-citations) or a percentile rank of 2 percent or above. He congratulated Prof. Rajesh Kumar Bhushan and Dr. Bibhu Prasad Swain for this remarkable feat.

The Director invited the Registrar (i/c) to initiate the proceedings on the agenda items.

ITEM NO. 23.1: **Confirmation of the minutes of the 22nd Senate meeting held on 21/09/2021 via Composite mode**

The 23rd Senate meeting confirmed the minutes of the 22nd Senate meeting held on 21/09/2021.

ITEM NO. 23.2: **Action taken on the decision of the 22nd Senate Meeting held on 21/09/2021 via Composite mode**

The actions taken on various decisions of the 22nd meeting of the Senate are as follows:

Sl. No.	Item No.	Agenda	Decision Taken	Action Taken	Remarks
1.	ITEM NO. 22.3	To recommend the award of B.Tech degree to those students who graduated in 2021 in the 8th Convocation	The 22nd Senate approved 140 students for the award of B.Tech degree in the 8th Convocation	Awarded the B.Tech degree in the 8th Convocation held on 05/10/2021	Noted
2.	ITEM NO. 22.4	To recommend the award of M.Tech degree to those students who graduated in 2021 in the 8th Convocation	The 22nd Senate approved 40 students for the award of M.Tech degree in the 8th Convocation	Awarded the M.Tech degree in the 8th Convocation held on 05/10/2021	Noted
3.	ITEM	To recommend the	The 22nd Senate approved 26	Awarded the M.Sc	Noted

	NO. 22.5	award of M.Sc degree to those students who graduated in 2021 in the 8th Convocation	students for the award of M.Sc degree in the 8th Convocation	degree in the 8th Convocation held on 05/10/2021	
4.	ITEM NO. 22.6	To recommend the award of Ph.D degree in the 8th Convocation to those students who graduate Ph.D	The 22nd Senate approved the 6 students for the award of Ph.D degree in the 8th Convocation. 22nd Senate also approved providing of provisional Ph.D degree to those students who will be completing their degree until the conduction of 23rd senate.	Awarded the Ph.D degree in the 8th Convocation held on 05/10/2021	Noted
5.	ITEM NO. 22.7	Award of Gold Medals 1. To recommend the award of Institute Gold medals to departmental toppers in B. Tech programme	1. The 22nd Senate approved to award of Institute Gold medals to departmental toppers in B. Tech programme viz: Roshan Loitongbam (CE), Himanshu Singh (ECE), Shailesh Prajapati (EE), Lal Krishna Pal (ME)	1. Awarded Institute Gold medals to departmental toppers in B. Tech programme viz: Roshan Loitongbam (CE), Himanshu Singh (ECE), Shailesh Prajapati (EE), Lal Krishna Pal (ME) in the 8th Convocation held on 10/10/2021.	1. Noted
		2. To recommend the award of Chairman's Gold Medal to Overall Topper in B.Tech programme.	2. The 22nd Senate approved to award Chairman's Gold Medal to Avichal Srivastava, CSE who is the overall topper in B.Tech programme	2. Awarded Chairman's Gold medal to Avichal Srivastava, CSE who is the overall topper in B.Tech programme in the 8th Convocation held on 05/10/2021.	2. Noted
6.	ITEM NO.	To rectify in the MIS for semester promotion of	The 22nd Senate meeting approved to remove the provision in the MIS that	Notification issued vide No.NITM.3/(3-	Noted

	22.8	B.Tech students	a student must pass all 2nd year courses before registering for the 4th year courses as there is no such provision in B.Tech ordinance approved in 2013 and 2020.	Acad)/ Notice/2018/78, dated 06/10/2021	
7.	ITEM NO. 22.9	To consider for ex-post facto approval for promotion of Angom Jayalaxmi Devi bearing Enrolment no 18105003 a student of ECE department	The 22nd Senate meeting gave ex-post facto approval for promotion of Angom Jayalaxmi Devi bearing Enrolment no 18105003, a student of ECE department, to 5th semester.	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/79, dated 06/10/2021	Noted
8.	ITEM NO. 22.10	Discussion and seeking clarification for those students who have not appeared in all the exam (i.e Internal, Mid and End) or End term for all subjects in a semester due to COVID-19 for his/her or for kith and kins.	The student who has not attended any class as well as not appeared in all the exams (Internal, Mid semester and End Semester exams) in all course in a semester due to COVID-19 before promotion to the next semester, he/she has to register, pay the required fee and attend all the classes and need to pass that semester exam first. In view of the above, the Senate approved the Departmental Undergraduate Program Committee (DUPC) recommendation for re-registration of Mr. Vinay Kumar Rana bearing Enrolment No. 17103044, a student of CSE in upcoming 6th semester, as he did not attend any class and Lab of 6th semester as well as not appeared in any examination but he was promoted to 7th semester.	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/80, dated 06/10/2021	Noted
9.	ITEM NO. 22.11	To discuss the case of Anurag Macharla, Enrolment no -20104012 of Electrical Engineering Department	The 22nd Senate meeting approved the following DUPC recommendation about Anurag Macharla, Enrolment No -20104012 of Electrical Engineering Department; 1. He needs to register fresh for the first semester by paying the required fee.	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/81, dated 06/10/2021	Noted

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			2. He needs to attend the classes of Theory and Lab. of all the courses, appear in all the Internal, Mid semester, and End semester exams and submit the assignments, lab file etc.		
10.	ITEM NO. 22.12	To discuss and ratify the conduct of written exams and interviews and to fix the cut-off marks of M.Tech and MSc. admission for students of non-GATE/ non JAM (without scholarship) for the vacant seats.	The 22nd Senate meeting ratified the resolutions adopted by the HoDs meeting held on 18/08/2021 which is detailed below: As per 18th senate meeting minutes item no 18.7, the Senate recommended that the vacancy of seats in M.Tech (all branches) and MSc (all departments) after CCMT and CCMN can be filled up through the selection pattern given below: Academic assessment (10,10+2,Graduation) : 20 Written test with Video camera observation online : 30 Interview :50 All the departmental heads agreed to follow the decision of senate and to further marks distribution of Academic assessment as follows: 10th percentage of marks, will be multiplied by 0.05 10+2 or diploma percentage of marks, will be multiplied by 0.05 Graduation percentage of marks, will be multiplied by 0.1 Where CGPA/CPI is mentioned, it will be converted in to percentage. The total number of questions will be 30, each question will carry one mark with four options and the total duration of the examination will be one hour. There will be no negative marking for wrong answer. The departmental head will constitute a five-member committee for the interview and each member will assess the performance of student based on 10 marks. Summation of all	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/82, dated 06/10/2021	Noted

			three components is the total marks of assessment for merit list. An effort should be made for video recording and capturing photo of the written and interview session. One overall merit list (open), one merit list for general candidates, one merit list for OBC candidates (NCL), one merit list for SC candidates and one merit list for ST candidates will be prepared. Vacant seats in each category will be filled in the order of merit from that category. If any OBC (NCL), SC, ST candidate is having higher merit in overall merit list, he/she will get seat from there.		
11.	ITEM NO. 22.13	Proposal for Annual faculty awards [Excellence in Research, Teaching, IPR, Patents] –	The Senate approved the following 1. Best faculty Award: Research Activity (Publication and Research Fellowship) -One Award. 2. Best faculty Award: Research project and Laboratory Development- One Award. 3. Best faculty Award: IPR/Patents/Copyrights/Innovation/Start-up - One Award. 4. In place of google scholar, UGC CARE listed journals are to be included. 5. Director is authorised to constitute a committee of only external members of Senate to review the criteria and guidelines, assess the nominations received and recommend the faculty for each award. Dean F/W will act as Secretary. 6. Only the certificate of appreciation will be provided. No cash prize will be provided.	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/83, dated 06/10/2021	Approved the guidelines for the selection and the format of the application form for the Annual Best Faculty Award in the Agenda Item No. 23.11 of the 23rd senate
12.	ITEM	Cancellation of Ph.D	The 22nd Senate meeting approved	Notification issued	Noted

	NO. 22.14	programme of Mr. Hemant Kumar, Ph.D scholar (Enrollment No. 20407002)	for the Cancellation of Ph.D seat of Mr. Hemant Kumar, Ph.D scholar, Enrollment No. 20407002 of Mechanical Engineering Department.	vide No.NITM.3/(3-Acad)/ Notice/2018/84, dated 06/10/2021	
13.	ITEM NO. 22.15	To consider and approve for change of Supervisor of two Ph.D scholars (Mr. A. Sibo Anthony (18407006) and Mr. Md. Imran Ahmed (18407007)	The 22nd Senate approved the recommendation of DPPC for the appointment of Dr. H. Neeranjan Singh, Asst. Prof. and HoD, ME department , NIT Manipur to be the Ph.D supervisor of Mr. A. Sibo Anthony, Enrollment No. 18407006 and Mr. Md. Imran Ahmed, Enrollment No. 18407007 and for the addition of Dr. Tikendra Nath Verma, Asst. Prof., ME Deptt., MANIT Bhopal as Co- Supervisor of Mr. A. Sibo Anthony. Senate also opined that students should be allowed to continue in the same area of research, even though supervisor is changed. The Senate also approved the DPPC recommendation considering the situation and welfare of the Ph.D students, the matter of relaxation for half a quota with the addition of two Ph.D scholars to Dr. H. Neeranjan Singh. The total Ph.D scholar's quota is 4.5 (four and half) against 4.	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/85, dated 06/10/2021	Noted
14.	ITEM NO. 22.16	To discuss about the Students who have crossed the maximum period of their PhD, 06 years (Regular) , 07 years (Part time) as they are facing problems due to COVID and request for extension of such cases.	The 22nd Senate meeting approved to extend by 1 (one) more year to the maximum period mentioned in Ph.D ordinance-2020 for the students who have taken admission in PhD in between 18-3-2020 to 03-09-2021, but without scholarship and contingency during the extension period (Due to Pandemic situation).	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/86, dated 06/10/2021	Noted
15.	ITEM NO. 22.17	To consider and approve for the extension of Ph.D tenure for Mr. Ngasepam Bhogenjit Singh (15PCH003), Mr.	Considering the prevailing COVID-19 situation, the 22nd Senate meeting approved the DPPC recommendation for the extension of Ph.D (maximum) period by one year in	Notice issued vide No.NITM.3/(3-Acad)/ Notice/2018/70,	Noted

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		Thiyam Samrat Singh (15PCH004), Ms. Longjam Reena Devi (15PCH002) and Ms. Bandana Sanasam (15PCH006) of Chemistry department	reference to the date of Ph.D registration	dated 28/09/2021	
16.	ITEM NO. 22.18	To consider and approve for the extension of Ph.D programme period for Ph.D scholars of Computer Science & Engineering Department	Considering the prevailing COVID-19 situation, the 22nd Senate meeting approved the DPPC recommendation for the extension of Ph.D (maximum) period by one year in reference to the date of Ph.D registration	Notice issued vide No.NITM.3/(3-Acad)/ Notice/2018/71, dated 28/09/2021	Noted
17.	ITEM NO. 22.19	To consider and approve for the extension of Ph.D programme period for Ph.D scholars of Mathematics Department	Considering the prevailing COVID-19 situation, the 22nd Senate meeting approved the DPPC recommendation for the extension of Ph.D (maximum) period by one year in reference to the date of Ph.D registration

As for Laishram Shanjit Singh, the 22nd Senate meeting approved the DPPC recommendation to extend the Ph.D program period upto 30/09/2021 because if extended for 1 year after the expiry period, it will be lapsed in 13/08/2021. So, on case to case basis and considering the welfare of the student, the Senate extended the Ph.D programme period of Laishram Shanjit Singh upto 30/09/2021. | Notice issued vide No.NITM.3/(3-Acad)/ Notice/2018/72, dated 28/09/2021

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Notice issued vide No.NITM.3/(3-Acad)/ Notice/2018/73, dated 28/09/2021 | Noted |
| 18. | ITEM NO. 22.20 | To consider and approve for the extension of Ph.D programme period for Loukrakpam Chandramani (Enrollment No. 15PCE003), Ph.D scholar, Civil Engineering Department | Considering the prevailing COVID-19 situation, the 22nd Senate meeting approved for the extension of Ph.D (maximum) period by one year against the date of Ph.D registration | Notice issued vide No.NITM.3/(3-Acad)/ Notice/2018/74, dated 28/09/2021 | Noted |
| 19. | ITEM NO. | To consider and approve for the extension of | Considering the prevailing COVID-19 situation, the 22nd Senate meeting | Notice issued vide No.NITM.3/(3- | Noted |

	22.21	Ph.D programme period for Ngangom Robertson (Enrollment No. 15PCE001), Ph.D scholar, Civil Engineering Department	approved for the extension of Ph.D (maximum) period by one year in reference to the date of Ph.D registration	Acad)/ Notice/2018/74, dated 28/09/2021	
20.	ITEM NO. 22.22	Discussion on the issue of UGC approved Journal for the department of Humanities and Social Sciences	The 22nd Senate referred issue to the committee constituted Vide Order No.NITM.1/(7-Estt)/Order/2021/505 dated 02/09/2021 to examine and to put up in the next Senate meeting.	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/87, dated 06/10/2021	Noted
21.	ITEM NO. 22.23	To ratify the committee formed vide Order No. NITM.1(7-Estt)/Order/2021/505 dated 02/09/2021 to examine and advise the faculty members and scholars regarding their publications.	The 22nd Senate ratified the committee formed vide Order No.NITM.1(7-Estt)/Order/2021/505 dated 02/09/2021 to examine and advise the faculty members and scholars regarding their publications. Senate advised to induct 02 external members (01 from Engineering stream and 01 from Science stream) as Co-opted member in the existing committee.	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/88, dated 06/10/2021.	Noted
22.	ITEM NO. 22.24	To consider and approve for conducting Synopsis presentation seminar after the expiry of Ph.D course period of Laishram Shanjit Singh, Enrollment No.14PHM001, a Ph.D student of Mathematics department	The 22nd Senate meeting approved for conducting Synopsis presentation seminar on 29/07/2021 after the expiry of Ph.D course period of Laishram Shanjit Singh, Enrollment No.14PHM001, a Ph.D student of Mathematics department	Notice issued vide No.NITM.3/(3-Acad)/ Notice/2018/75, dated 28/09/2021	Noted
23.	ITEM NO. 22.25	To consider and permit Dr. Biraj Shougaijam, Assistant Professor, Manipur Technical University as Co-Supervisor of Ms. Rosy Kimneithem Haokip, Enrollment No. 19405005 of ECE department.	The 22nd Senate meeting permitted Dr. Biraj Shougaijam, Assistant Professor, Manipur Technical University to act as Co-Supervisor of Ms. Rosy Kimneithem Haokip, Enrollment No. 19405005 of ECE department	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/89, dated 06/10/2021	Noted
24.	ITEM	To consider and permit	The 22nd Senate meeting instructed	NOC has been	Approved

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	NO. 22.26	Dr. Mukul Gupta, Scientist G of UGC-DAE Consortium for Scientific Research (An Autonomous Institution of UGC, New Delhi) as Co-Supervisor of Ms. Aisyarya Madhuri (Enrollment No. 21409002), Ph.D scholar, Physics Department	to seek NOC from UGC-DAE Consortium for Scientific Research (An Autonomous Institution of UGC, New Delhi) to act as co-supervisor	received from Dr. Vasant G. Sathe, Centre Director, UGC-DAE Consortium for Scientific Research, Indore Centre for permitting Dr. Mukul Gupta, Scientist G as Co-Supervisor of Ms. Aisyarya Madhuri (Enrollment No. 21409002), Ph.D scholar, Physics Department.	
25.	ITEM NO. 22.27	To consider and approve in the change of category (from regular Ph.D programme to Part-time Ph.D programme) for R.K. Nanao Ningthemcha (Enrollment No. 18405004) of ECE department	The 22nd Senate meeting directed R.K. Nanao Ningthemcha (Enrollment No. 18405004) of ECE department to provide NOC from Directorate of Higher Education, Govt. of Manipur.	The matter was conveyed to R.K. Nanao Ningthemcha	Placed the NOC issued by Principal, Nambol L. Sanoi College, Khongkham Awang, Nambol, Manipur for consideration in Item No. 23.22
26.	ITEM NO. 22.28	To consider and approve for rectification of course codes in the copy of M.Sc Chemistry syllabus uploaded in the institute website	The 22nd Senate approved for rectification of course codes in the copy of M.Sc Chemistry syllabus uploaded in the institute website.	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/90, dated 06/10/2021	Noted
27.	ITEM NO. 22.29	To consider and approve for alteration of syllabus for Ph.D course work in the Department of Chemistry	The 22nd Senate meeting approved for alteration of syllabus for Ph.D course work in the Department of Chemistry considering the repetition of same courses during the Ph.D course work for selected in-house Ph.D candidates and to implement the syllabus towards more research – oriented manner as recommended by DPPC	Notification issued vide No.NITM.3/(3-Acad)/ Notice/2018/91, dated 06/10/2021	Noted
28.	ITEM NO. 22.30	Diversification of the present M.Tech (Environmental & Water	The 22nd Senate recommended to form a Committee taking into view the concerns of placement of M.Tech	Notification issued vide No.NITM.3/(3-Acad)/Notice/2018/	Discussed as agenda item in

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				92,dated 06/10/2021 Committee formed vide Office Order No.NITM.3/(106-Acad.)/Order/2021/28 dated 11/10/2021 and the meeting was held on 11/11/2021.	23rd Senate
		Resources Engg) course into two inter-specializations i.e. Hydro Engg. and (ii) Environmental Engg, respectively	students		
29.	ITEM NO. 22.31	To consider Pre-Synopsis seminar conducted on 16/07/2021 after the expiry of 6 years and also to consider and approve for the extension of Ph.D programme period for 6 months for Mr. Kshetrimayum Momo (Enrollment No. 15PEN001), Ph.D scholar, Humanities and Social Sciences Department	The 22nd Senate considered the conduction of Pre-Submission seminar for Mr. Kshetrimayum Momo (Enrollment No. 15PEN001), Ph.D scholar, Humanities and Social Sciences Department, even though it was conducted after the expiry of 6 years in view of COVID-19 situation.

Considering the prevailing COVID-19 situation, the 22nd Senate meeting approved for the extension of Ph.D (maximum) period by one year | Notice issued vide No.NITM.3/(3-Acad)/Notice/2018/76, dated 28/09/2021 | Noted |
| 30. | ITEM NO. 22.32 | Any other items with the permission of the Chair | 1. Approval of Academic Calendar for M.Tech and M.Sc 1st Semester.

Senate approved the Academic Calendar of M.Tech and M.Sc 1st Semester (September,2021 - December,2021) | 1. Notice vide NITM.3/(21-Acad)/A-Calendar/2012/15 dated 28/09/2021 | Noted. |

ITEM NO. 23.3: **To consider and approve the starting of Post Doctoral programme in ECE Department**

The Senate noted that Post Doctoral Program is not a regular programme and opined that there is no point of putting this in the Senate.

ITEM NO. 23.4: **Discussion about Ph.D students who had submitted Ph.D thesis without any SCI/SCIE publications in Science and Engineering subjects**

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The following student of Civil Engineering Department requested for submission of thesis without any SCI/SCIE indexed journal publications

S.N.	Name of the student	Enrollment No.	Department	No. of Publications		
				SCI/SCIE	SCOPUS (only)	International Conference
1.	Loukrakpam Chandramani	15PCE003	CE	0	1	1

The Senate approved the recommendation of the Journal Verification Committee meeting held on 22/10/2021 and accordingly permitted to send the Ph.D thesis for examination as a special case, as his Ph.D course period (6 years for regular students) had already expired.

ITEM NO. 23.5: **Discussion about Ph.D scholars in Humanities and Social Sciences subjects who had submitted Ph.D thesis without any SCI/SCIE publications**

The following student of Humanities and Social Science (English) Department requested for submission of Ph.D thesis without any SCI/SCIE indexed journal publication.

S.N.	Name of the student	Enrollment No.	Department	No. of Publications		
				SCI/SCIE	SCOPUS (only)	Other journals
1.	Kshetrimayum Momo	15PEN001	HSS	0	0	5

The Senate approved the recommendation of the Journal Verification Committee meeting held on 22/10/2021 and accordingly permitted to submit the Ph.D thesis for examination as a special case, as his Ph.D course period (6 years for regular students) had already expired.

ITEM NO. 23.6: **To consider and approve to provide provisional degree certificate to students who had passed their degree not in usual May-June of that particular year and for providing Original Degree certificate in the 9th Convocation**

The Senate approved to issue provisional degree certificate and for awarding the Original Degree certificate in the 9th Convocation for the following students.

S.N.	Name of the student	Enrollment No.	Programme	Department
1.	Maisnam Luwanganba Singh	12UEE012	B.Tech	EE
2.	Ketha Ganesh	17205002	M.Tech	ECE
3.	Rohit Singh Pheiroijam	18205002	M.Tech	ECE

The Senate also decided that provisional degree could be given to the students any time in the year with the approval of Director but the final degree certificate will be provided in the next Convocation only.

ITEM NO. 23.7: **To consider and approve for an advance of 50% processing fee for Patent Filing from PDA grant**

The Senate recommended an advance of 50% processing fee for Patent Filing from CPDA grant subject to Finance Committee and BoG approval.

ITEM NO. 23.8: **To ratify the seat matrix for CSAB-2021 with EWS reservation**

The Senate ratified the B Tech seat matrix for CSAB-2021 with 10%EWS reservation (as per the guide line from MoE).

ITEM NO. 23.9: **To consider and approve the list of criteria recommended by the Journal Verification Committee for Ph.D thesis submission**

Based on the Journal Verification Committee meeting held on 22//10/2021, the Senate approved the following criteria for Ph.D thesis submission.

1. In case of Engineering & Science, two SCI/SCIE or one SCI/SCIE and one Scopus (Published or Accepted only journal papers to be considered) and one Conference paper (Oral presentation in National/International Conference).

2. In case of Humanities & Social Sciences, two AHCI/SSCI/Scopus/ UGC Approved Care list A (Published or Accepted only journal papers to be considered) and one Conference paper (Oral presentation in National/International Conference)

3. Ph.D scholar should be the first author. Senate did not give any comments on the other sequences of Authors.

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4. Above amendments are to be made in Ph.D ordinance. New rules will be applicable for all those Ph.D students, who will be enrolled after amendments are made in Ph.D ordinance.

ITEM NO. 23.10   **To consider and permit Dr. Mukul Gupta, Scientist G of UGC-DAE Consortium for Scientific Research (An Autonomous Institution of UGC, New Delhi) as Co-Supervisor of Ms. Aisyarya Madhuri (Enrollment No. 21409002), Ph.D scholar, Physics Department**

The Senate permitted Dr. Mukul Gupta, Scientist G of UGC-DAE Consortium for Scientific Research (An Autonomous Institution of UGC, New Delhi) as Co-Supervisor of Ms. Aisyarya Madhuri (Enrollment No. 21409002), Ph.D scholar, Physics Department based on the receipt of NOC from Dr. Vasant G. Sathe, Centre Director, UGC-DAE Consortium for Scientific Research, Indore Centre.

ITEM NO. 23.11:   **To consider and approve the Guidelines for the selection and the format of the application form for the Annual Best Faculty Award, NIT Manipur**

The Senate approved the Guidelines for the selection and the format of the application form for the Annual Best Faculty Award, NIT Manipur approved by the Committee, which held its meeting on 24/11/2021. Guidelines and Application format appended as **Annexure – 1.**
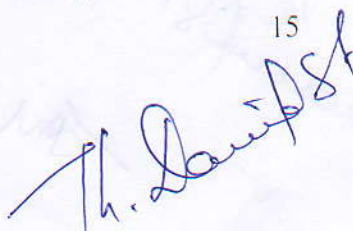
ITEM NO. 23.12   **Discussion on the Re-Structuring and/or Diversification of the present M.Tech (Environmental & Water Resources Engg) in Civil Engineering into three (3) specializations with 5 seats each (5 × 3 = 15) of the existing 15 total seats: (I) Hydro Engg., (II) Environment Engg. and (III) Structural Engg.**

Based on the EWS reservation norms to be enforced in CCMT-2022, number seats in M Tech will increase to 20. Senate decided to continue with the same M.Tech in Civil Engineering with specialization in Environmental & Water Resources Engineering with 10 seats in view of requirement of minimum 10 seats for various scholarship/ fellowships, rank certificate and to facilitate proper distribution of 10 seats among GEN, OBC, EWS, SC and ST candidates.

ITEM NO. 23.13:   **To consider and approve the proposal for opening of M.Tech (Structural Engineering) course in line with Item No. 23.12 and approval for PG Structural Engineering**

In line with Item No. 23.12, the Senate approved the M.Tech in Civil Engineering with specialization in Structural Engineering with 10 seats. Course is to be taught by existing faculty members until additional faculty for Structural Engineering is recruited. The Senate also approved the Course structure appended at **Annexure – 2**, but the course codes are to be changed

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as per the scheme of coding approved in ITEM No 23.21and it will be effective from academic year 2022-2023. Senate also approved to include M.Tech in Civil Engineering with specialization in Structural Engineering in M Tech ordinance.

ITEM NO. 23.14: **To consider for Post-Facto Approval for PG (PhD/M.Tech) Structural Engineering 5 courses (adopted as PhD coursework which has been previously put to notice) w.e.f. 01/07/2016 as was earlier recommended by the DPPC Meeting.**

The Senate ex-post facto approved the PG (PhD/M.Tech) courses in Structural Engineering, which is appended at **Annexure-3,** but the course codes are to be changed as per the scheme of coding approved in ITEM No 23.21

ITEM NO. 23.15: **To consider and approve for Further Extension in time period for PhD study programme in respect of PhD R/S, Shri Ngangom Robertson, bearing Enr No. 15PCE001, who have crossed 6 yrs (FT)**

After threadbare discussion and deliberation, the Senate deferred the matter.

ITEM NO.23.16: **To consider and approve for addition of Co-Supervisor of L. Bilashini Chanu, Ph.D scholar (Part-Time), Enrollment No.17401003 of Civil Engineering Department and for Change of External Doctoral Committee member**

The Senate approved Dr. Th. David Singh, Associate Professor, Chemistry Department, NIT Manipur as Co-Supervisor of L. Bilashini Chanu, Ph.D scholar (Part-Time), Enrollment No.17401003 and also approved Dr. Shuma Adhikari, Asst. Prof. & HoD, Electrical Engineering Department as the new External member of the Doctoral Committee.

ITEM NO. 23.17: **To ratify the grant of No Objection Certificate for 6 months Internship at InfoEdge India**

The Senate ratified the grant of No Objection Certificate for 6 months Internship at InfoEdge India to the following three B.Tech students

Sl. No.	Name	Enrollment	Branch	Email-ID	Contact Number
1.	Dewal Chaturvedi	18105007	ECE	dewalchaturvediofficial@gmail.com	6388372926
2.	Atul Singh	18103010	CSE	Atul.as72@gmail.com	8707255950

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| 3. | Saurav Mandal | 18103041 | CSE | Ksourav41@gmail.com | 9773069451 |

ITEM NO. 23.18: Discussion on the issue of providing/issuing Rank Certificate to Maitraye Raaj, Enrollment No.17107008 of Mechanical Engineering

After threadbare discussion, deliberation, and examining all the details related to disciplinary action against Maitraye Raaj, Enrollment No.17107008 of Mechanical Engineering because of Ragging that is a very serious offence, the Senate decided not to issue any Rank Certificate to him.

ITEM NO. 23.19 To consider and approve the Standard Operating Procedure (SOP) to be adopted for Online Class during January-June, 2022 session

The Senate approved the Standard Operating Procedure (SOP) for Online Class during January-June, 2022 session which is appended at **Annexure – 4.**

ITEM NO. 23.20: To consider and approve the Academic Calendar for B.Tech 1st year students (2021 batch)

The Senate approved the Academic Calendar for B.Tech 1st year (Online Classes due to COVID-19) which is appended at **Annexure-5.**

ITEM NO. 23.21: To consider and approve the Course code guidelines and course for B.Tech, M.Tech, M.Sc and Ph.D

The Senate approved the Course code guidelines and course w.e.f current semesters, as per the course structure XX-Y-M-N, for B.Tech (Civil, ECE, EE, CSE & ME appended at **Annexure - 6**) M.Tech (Civil, ECE, EE, CSE & ME appended at **Annexure - 7**) , M.Sc (Physics, Chemistry, Maths appended at **Annexure - 8**) and Ph.D(Civil, ECE, EE, CSE, ME, Physics, Chemistry, Maths, HSS appended at **Annexure 9**). Course structure XX-Y-LM-N will be implemented w.e.f academic year 2022-2023.

ITEM NO. 23.22: Any other items with the permission of the Chair

1. To consider and approve in the change of category (from regular Ph.D programme to Part-time Ph.D programme) for R.K. Nanao Ningthemcha (Enrollment No. 18405004) of ECE department

   The 22nd Senate meeting directed R.K. Nanao Ningthemcha (Enrollment No. 18405004) of ECE department to provide NOC from Directorate of Higher Education, Govt. of
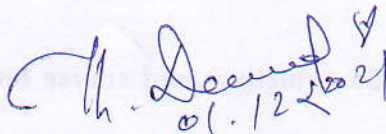
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01-12-2021

Manipur. This time, R.K. Nanao Ningthemcha submitted the NOC issued by the Principal, Nambol L. Sanoi College, Khongkham Awang, Nambol, Manipur. As per Clause 2.1 of the Ph.D Ordinance, the Chairman, Institute Postgraduate Programme Committee (IPPC) on recommendation of the Departmental Postgraduate Programme Committee (DPPC) approves change from one category to another (except to regular category). Form 12 (Change of Category from Regular to Part-Time) has already been approved by the Chairman, IPPC.

In view of the above, the Senate approved the change of category (from regular Ph.D programme to Part-time Ph.D programme) for R.K. Nanao Ningthemcha (Enrollment No. 18405004) of ECE department

The meeting ended with vote of thanks to the Chair.
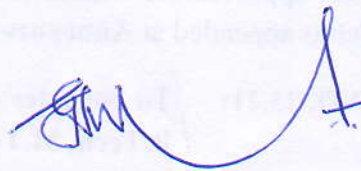
01-12-2021

Dean (Academic Affairs)

01.12.2021

(Dr. Th. David Singh)
Registrar (i/c)
Secretary, Senate
National Institute of Technology Manipur

(Prof. (Dr.) Goutam Sutradhar)
Director, NIT Manipur
Ex-Officio Chairman, Senate
National Institute of Technology Manipur

राष्ट्रीय प्रौद्योगिकी संस्थान,मणिपुर
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An Autonomous Institute under MHRD, Govt. of India.

APPLICATION FORM FOR ANNUAL BEST FACULTY AWARD

1. Full name of the faculty (in block letters): _____

2. (a) Current Position Held: _____

    (b) Department: _____

    (c) Specialisation: _____

3. Best Faculty Award applying for:
    (Check only one)

Sl.No.	Categories of the Awards	Check only one	Information to be filled up and submitted
A	Research Activity (Publication and Research Fellowship)		Sl.No. 5 and 6
B	Research Projects and Laboratory Development		Sl.No.7
C	IPR/Patents/Copyrights/Innovation/Startup		Sl.No.8

Note: i) Please attach the required documentation along with this filled up application form for the award category you have checked above. Guidelines and information associated with Best Faculty award is available online at our institute website.

ii) If a faculty is applying for more than one category, he/she need to used separate application form

iii) It is requested that all application materials be compiled into one document, saved, and submitted electronically to office of Dean (FW) for consideration. A hardcopy of the same endrosed by the concerned Head of the department should be submitted to office of Dean (FW) on or before 30.06.2022.

4. Experience in NIT Manipur as a regular faculty (in years): _____

5. No. of Paper publications in National and International Journals (last academic year i.e. (*01.07.2021 to 30.06.2022*)

Sl No.	Title of paper	Co-author(s), if any	Journal Name	Vol. & Year	SCI/SCIE/SCOPUS Index| Thomson Reuteur: Impact Factor|

6. Details on International/National Fellowship recieved during the last academic year i.e. (*01.07.2021 to 30.06.2022*)

Sl No.	Name of the fellowship program	Granting institute and country	Fellowship duration	Purpose of the fellowship	Additional Remarks

7. Details on the Research Projects and Laboratory Development during the last 3 year:

A. Research projects: *(01.07.2019 to 30.06.2022)*

Sponsoring Agency	Title of the Project	Area	Period	Amount of grant*	Whether completed	Accomplishment

* Grant amount > 15 lakhs will only be considered.

B. Laboratory Development in the department during the last 3 years: *(01.07.2019 to 30.06.2022)*

Sl. No.	Name of Laboratories	Level – UG/PG	Department	Started from (Year)	Remarks

* Endrosement by the concerned departmental Head is necessary in all the supporting documents.

8. Details on the IPR/Patents/Copyrights/Innovation/Startup during the last academic year

Details of IPR/ Patents/Copyrights/Innovation/Startup [01.07.2021 to 30.06.2022]					
Sl. No.	Title	Registration details	Registration date	Name of Co-Inventors/ Co-Coordinators	Any additional Information

<u>Declaration by the applicant:</u>

"I do hereby declare that all statements/information provided in the application are true, complete and correct to the best of my knowledge and belief. I understand that in case of any information furnished by me is found false/incorrect/incomplete or ineligible, my candidature for the selected faculty awards is liable to be rejected or cancelled. Even after conferment of the award, if statements/information is found false or incorrect, the award may be withdrawn without any further clarification."

Place: Signature of the Faculty

Date:

<u>Endorsement from the concerned Head of the Department:</u>

Signature of the concerned HOD

Annual Best Faculty Awards

[Excellence in Research Publications, Research Projects, IPR, Patents]

Annual Best Faculty Awards

Every academic year starting from academic session 2021-22, Annual Best Faculty Awards is to be given to the regular faculty of the institute. The proposed caterogies are in areas of excellence in research activities, research projects and laboratory development and in IPR, Patents/Copyrights/Startup etc. The main objective of this recognition, which is to be given to a faculty member of the institute, is to encourage excellence in teaching and research with high quality research activities for the overall development of the institute.

The faculty awards is proposed to be given in the following 3 categories as listed below by considering various parameters/criteria's for the evaluation by an 3 member external committee with the Dean (FW) as the secretary of the committee.

It is proposed that every year the faculty awards giving ceremony be held on the **"Foundation Day"** of NIT Manipur which fall on **12th August** of every year.

1. Best Faculty Award: Research Activities (Publication and Research Fellowships) [2 number - Engineering Science, Natural &Social Science]

Under this category, it is proposed to give 2 awards- one from Engineering Science and another one from Natural & Social Science group. It is proposed to consider only the publications made during the last one academic year. **SCI and Scopus** is proposed to be considered to judge the citations of research publications as followed in others institute of national importance. The various parameters/criteria's as described below may be adopted for the purpose of evaluating the application from the potential applicants (only regular faculty members of the institute having a minimum of 3 years experience in NIT Manipur).

Criteria	Evaluation Criteria- Points	Evaluation Criteria Points by committee member(s)	
Number of quality research publications in international/national journal (SCI, SCOPUS) during last one academic year	2 Point per research publication.	If the applicant is the single author/first author/corresponding author of the publication	Full point
		If the publication have 2 authors and the applicant is not first author/corresponding author	70% of total point value
		If the publication have more than 2 authors and the applicant is not first author/corresponding author	40% of total point value

1

1.	Citations during last one academic year	1 Point per 15 citations	---		
2.	For outstanding research publication in Journals with IF≥5 (excluding review papers) during last one academic year	5 Points per publication.	If the applicant is the single author/first author/corresponding author of the publication	Full point	
			If the publication have 2 authors and the applicant is not first author/corresponding author	70% of total point value	
			If the publication have more than 2 authors and the applicant is not first author/corresponding author	40% of total point value	
3.	Prestigious international/ national research fellowships at least for a period of 6 months during last one academic year	10 Points	----		

Note:

1. Research publications of faculty **showing affiliation of NIT Manipur** will only be considered.

2. All faculty need to provide an updated Scopus ID, Google scholar link on their institute webpage.

3. The data will be verified from the profile available on the institute website and from the respective journal homepage.

4. Research publications of faculty as the **first author, corresponding author, main supervisor, 2nd/3rd co-authors** will only be considered for evaluation.

5. **Thomson Reuters Impact Factor** will only be considered on evaluating excellent/outstanding research publication.

2. Best Faculty Award: Research Projects and Laboratory Development [2 number - Engineering Science, Natural &Social Science]

This category of the awards is proposed to be given to one of the faculty from Engineering Science and another one from Natural & Social Science group, who have contributed in generating the resources of the institute through Research grants in addition to carrying out high end research project. The project funding obtained from various government agencies, like DST, SERB, DRDO, ISRO, Ministry of Earth Science and Environment, CSIR, MoEFCC etc and private industries along with the Laboratory set up/development in the institute will be considered for this award in the following manner.

2

Criteria	Evaluation Criteria- Points
1. Research projects granted in **last three academic** year worth of: 15 lacs - 20 lacs/project Greater than 20 lacs/project	10 points/research project (15 lakhs- 20 lakhs) 20 points/research project (greater than 20 lakhs) * If the project has CO-PI, the point will be equally distributed among all the PIs.
2. Lab development in **last three academic year** >15 lacs (from external agency) >10 lacs (from own institute funding)	25 points / lab (external agency) + Additional 10 points of lab development with support of Industry 10 points / lab (institute funding)

Note: It should be noted that Laboratory development made under *the faculty research project funding will not be considered* for evaluation under this category. In addition, instrument purchased/installation for a particular lab and upgradation of the existing laboratory will not be considered as "Lab Development".

3. **Best Faculty Award: IPR/Patents/Copyrights**
   [1 number - All Engineering Science, Natural Science &Social Science]

This award category is proposed to be given to the faculty in recognition of his/her contribution to the IPR/Patents/Copyrights. The proposed criteria's to be considered for the evaluation in this category is described below.

Criteria	Evaluation Criteria -Points
Patents/IPR published: • Accepted with *commercial output* within last one academic year • Accepted within last one academic year with *no commercial output* • IPR filed	40 Points per IPR/Patent/Copyright (with commerical output) 20 Points per IPR/Patent/Copyright (with no commerical output) 3 points per IPR Max. 15 points

Note: *Proof of commercial output* need to be attached with the application for the purpose of claiming the points. *Information/Proof regarding the filed/published IPR* in last **one academic year** should also be provided along with the application.

General Guidelines that need to be considered and followed for the Annual Best Faculty Awards:

The following points need to be considered strictly while applying for the annual faculty awards under various categories by any of the regular faculty members of NIT Manipur. The application *which does not follow and meet the guidelines will not be considered for the evaluation by the committee.*

1. The total number of awards to be given considering all the proposed categories is five (5).

2. A regular faculty with **minimum of 3 years' experience in NIT Manipur** will be eligible to apply for the Annual Best Faculty Award of any category as proposed and describe in each relevant section.

3. For all the above proposed Annual Best Faculty Awards, **filled up application form** along with all relevant documents should be submitted only through HOD/Coordinator of department to the office of Dean (FW).

4. It is proposed that a faculty can participate in any/ all categories of these faculty awards and there is no bar on his/her to apply/compete every year for any/ all categories of these awards even if he/ she is a previous recipient.

5. Research publications of faculty showing **affiliation of NIT Manipur only** to be submitted for the faculty awards. *No review paper* will be considered in this category.

6. Research publications of faculty as the first author, corresponding author, main supervisor, $2^{nd}/3^{rd}$ co-authors will only be considered for evaluation in Research Activities category.

7. Faculty need to provide a list of publications with title of paper, name of journal, volume, page numbers and year of publication. In addition, *the front cover page of the journal and the content page of the journal for each of the research publication* need to be submitted along with the application.

8. Every application must be accompanied by the attested photocopy of necessary documents in support of claims made by the candidate for various faculty awards.

9. There is no need to attach the full copy of the published paper(s). *The first page of the research paper/publication, the front cover page of the journal and the content page of the journal for each of the research publication* have to be submitted for evaluation purpose.

10. In case of research projects/laboratory development/research fellowship and patents/IPR/copyrights, applicant needs to attach necessary documents like fund approval of the project, period of project, year of filing and certificate of grant of patents/IPR/copyrights, details of commercial output (if any).

11. The duration to be considered for the awards will be the last one academic year (1.07.2021 to 30.06.2022) except for the categories of "Research Projects and Laboratory Development" which will be the *last three academic year*.

12. The Annual Best Faculty Awards giving ceremony will be held on the **"Foundation Day" of NIT Manipur which falls on 12ᵗʰ August of every year**.

13. In case of outstanding research publication with IF≥5, applicant needs to mention the actual impact factor (**Thomson Reuters**) of the journal along with the details of publication.

14. It is proposed that each award consist *of a citation in recognition of their work and their contribution to the overall development of the institute*.

15. It should not be mandatory to award the faculty in all five proposed categories each year. The committee reserves the right not to award in the particular category in case no faculty found suitable in that category.

16. In case, *a tie occurs based on the calculated scores*, a single winner will be declared based on the senority (date of birth) and the length of service in NIT Manipur.

17. The decision of the review committee in the selection of the faculty for all the award category will be final. The final selected list may be put by committee to the Chairman, Senate of the institute for approval.

18. When submitting the complete application, all the applicant needs to provide a declaration as given below:

"*I do hereby declare that all statements/information provided in the application are true, complete and correct to the best of my knowledge and belief. I understand that in case of any information furnished by me is found false/incorrect/incomplete or ineligible, my candidature for the annual faculty awards is liable to be rejected or cancelled. Even after conferment of the award, if statements/information is found false or incorrect, the award may be withdrawn without any further clarification.*"

DEPARTMENT OF CIVIL ENGINEERING

M.Tech Structure Syllabus

राष्ट्रीय प्रौद्योगिकी संस्थान,मणिपुर

National Institute of Technology, Manipur

Langol, Manipur – 795 004, Ph. (0385)2445812/ e-mail: nitmanipur@yahoo.in

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PROPOSED M-TECH COURSE WORK SYLLABUS

Annexure - 2

Discipline: Structural Engineering

1st Semester (Odd semester)

Subject Code	Subject	Tentative coordinators	L	T	P	C
CE 551	Structural Dynamics	MSS	3	0	0	6
CE 561	Finite Element Methods for Static and Dynamic Problems	KSS	3	0	2	8
CE 557	Advanced Concrete Technology	MN	3	0	0	6
CE xxx	Elective subject 1	*	3	0	0	6
CE 535	Advanced computational lab	KSS	0	0	3	3
		Total credits	12	0	5	29

2nd Semester (Even semester)

Subject Code	Subject	Tentative coordinators	L	T	P	C
CE 552	Earthquake Resistant Design of Buildings	MSS	3	0	0	6
CE 562	Advanced Structural Design	NS	3	0	0	6
CE 564	Continuum Mechanics	KSS	3	1	0	8
CE xxx	Elective subject 2	**	3	0	0	6
CE 536	Advanced Structural lab	MSS	0	0	3	3
		Total credits	12	1	3	29

2nd Year

Subject Code	Subject	L	T	P	C
CE 605	M-tech Project 1 (1st Sem)	0	0	24	24
CE 606	M-tech Project 2 (2nd Sem)	0	0	24	24

List of Elective subjects in Odd semester (Elective 1)

Subject Code	Subject	Tentative coordinators	L	T	P	C
CE 559	Foundation Design	*NS	3	0	0	6
CE 561	Design of Plates and Shell structures	*KSS	3	0	0	6

List of Elective subjects in Even semester (Elective 2)

Subject Code	Subject	Tentative coordinators	L	T	P	C
CE 560	Optimization Methods in Engineering	**MN	3	0	0	6
CE 566	Structural Health Monitoring	**MN	3	0	0	6

Faculties: MSS- Dr M. Sunil Singh; KSS-Dr Kh. Sachidananda; MN- Mr M. Nongthouba; NS- Mr N. Sarkar

M.Tech Structure Syllabus

DEPARTMENT OF CIVIL ENGINEERING
राष्ट्रीय प्रौद्योगिकी संस्थान,मणिपुर
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PEOs, POs of M.Tech in Structural Engineering

Program Educational Objectives (PEOs) for the PG-Program (M.Tech) in Structural Engineering (SE):

PEO-1: To expose the students to advanced structural analysis, structural dynamics, allied theory in elasticity and plasticity, finite element method (FEM) etc.

PEO-2: To impart training to students in behaviour and design of advanced reinforced concrete (RC) structures, behaviour and design of advanced steel structure, latest procedures in earthquake resistant design practices and earthquake resistant design philosophies.

PEO-3: To expose the students to latest design codes, current national and international scenario on structural engineering and to motivate them in interdisciplinary involvement in problems related to Structural Engineering.

PEO-4: To orient the students to high value research related to structural engineering so that they get impetus to pursue research and lifelong learning.

Program Outcomes (POs) for the PG-Program (M.Tech) in Structural Engineering (SE):

PO-1: An ability to independently carry out research / investigation and development work to solve practical problems.

PO-2: An ability to write and present a substantial technical report/document.

PO-3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO-4: Program students will gain knowledge and skill in integrating Structural engineering concepts across multiple disciplines.

PO-5: Program students will develop understanding on project in Structural Engineering with ethical value towards social, environmental and economic development / sustainability.

PO-6: Students will develop interest to pursue higher studies and lifelong learning.

M.Tech Structure Syllabus

Course Title: Structural Dynamics	
Course Code: CE 551 — **No. of Credits: 6** — **L:T:P: 3-0-0**	**Learning hours: 45**
Pre-requisite Course Code and title (if any): Structural Analysis I and II, Higher Engineering Mathematics, Engineering Physics	
Department: Department of Civil Engineering	**Programme: M.Tech/PhD**
Course Co-ordinator/instructor:	**Course offered in : Semester II**
Course Type: Core	

Course Description:

This course provides the basic knowledge and understanding of the concept of vibration starting from single degree of freedom, multi degree of freedom. It provides the background approach to how the basic concepts are used to develop codal provisions. Also to present the application in design and analysis of building structures

Course Objectives:

1. This course provides the basic knowledge and understanding of the concept of vibration starting from single degree of freedom, multi degree of freedom and
2. It provides the background approach to how the basic concepts are used to develop codal provisions
3. Also to present the application in design and analysis of building structures

Course Content:

Module no.	Unit-I	Objective	L	T	P
1	Sources of vibration, types of excitation; spring action and damping : Degrees of freedom; Application of Newton's laws, D'Alembert's principle	To understand various aspects of vibration, excitation; spring action and damping : Degrees of freedom	2	0	0
2	Single degree of freedom systems: Mathematical model of physical systems; Free vibrations of undamped and viscously damped systems; Coulomb damping material and radiation damping	To understand the basics concept of dynamic equilibrium.	5	0	0
3	Response of viscously damped SDOF systems to harmonic excitations. Vibration isolation- Vibration arrest trench, Force transmissibility and base motion; Principle of vibration measuring instruments; Equivalent viscous damping structural damping	To be able to derive the response of viscously damped systems SDOF systems subjected to various excitations and its applications	5	0	0
4	Numerical evaluation of dynamic response of linear and non-linear systems	To be able to solve the SDOF system problems using numerical approaches	3	0	0
5	Frequency domain analysis	To be able to analyse the various SDOF system problems by frequency domain approach.	3	0	0
	Unit-II				
6	Multiple degree of Freedom systems: Vibrations of undamped 2 DOF systems; Response of 2 DOF to harmonic excitation, mode superposition, vibration absorber.	To understand the expansion of SDOF to MDOF system and their responses under different conditions.	4	0	0
7	Lagranges equations and their application to lumped parameter models of MDOF. Free vibrations of MDOF systems, methods of solving eigen value problems; iteration methods	Able to apply Lagranges equations to lumped parameter models of MDOF.	7	0	0
8	Dynamic response of MDOF systems – mode superposition method Dynamic response of MDOF systems – mode superposition method. Vibrations of Continuous systems: Free vibrations of continuous systems-axial transverse vibrations of beams. Numerical schemes for obtaining frequencies and mode shapes, vibration of elastic half space (Richart and Hall idealization)	To understand the Dynamic response of MDOF systems – mode superposition method	7	0	0

Nabajit Sarkar

DEPARTMENT OF CIVIL ENGINEERING

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National Institute of Technology, Manipur

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M.Tech Structure Syllabus

9	Response of beams to harmonic excitation	To understand the Response of beams to harmonic excitation	2	0	0
	Unit-III					
10	Earthquake Response of Systems : Response of SDOF and MDOF systems to earthquake excitation. Response spectra; Fourier spectra	To understand Earthquake Response of Systems : Response of SDOF and MDOF systems to earthquake excitation. Response spectra; Fourier spectra	3	0	0
	Total (Contact Hours)		45		

Evaluation Criteria: (Weightage: Theory -25%; Practical design problems -75%)
- 3 Unit tests: 20% each (average score)
- Mid Term Examination: 30%
- End Term Examination: 50%

Learning Outcome:
Students will be able to apply the concept of structural vibration in structural design and analysis.

Recommended Books or Text Book(s):
1. Dynamics of Structures, Second Edition (1993), by R.W. Clough, and J. Penzien, McGraw-Hill
2. Chopra, A.K. (1995), Dynamics of Structures: Theory and Applications to Earthquake Engineering Prentice Hall

References

1. Craig. R.R. Structural Dynamics, John Willey
2. Thomson, W.T. Theory of Vibrations, 3rd Edition, CBS Publishers, New Delhi

■ ■

Course Title: Finite Element Methods for Static and Dynamic Problems		
Course Code: CE 561	No. of Credits: 8	L:T:P: 3-0-2	Learning hours: 45
Pre-requisite Course Code and title (if any): Solid Mechanics, Structural Analysis		
Department: Department of Civil Engineering	Programme: M.Tech/PhD	
Course Co-ordinator/instructor:		
Course Type: Core	Course offered in : Semester I	

Course Description:
This course provides the basic knowledge and understanding of the concept of discretization of the big structure into small size members. The element, member concept and the assembly of the members has been highlighted. The boundary concept has also been included. The different techniques to solve the complex problem have been emphasizing.

Course Objectives:
1) To understand the stresses, strain and deformation undergone in the structure under the applied forces.
2) To learn basic principles of finite element analysis procedures.
3) To learn the theory and characteristics of finite elements that represent engineering structures.
4) To learn and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses.

Units	Topic	CO	L	T	P
Module 1	Introduction to Finite Element Model-concept of nodes and elements, types of analysis	The students should be able to understand the basic idea of finite element.	3	0	0

M.Tech Structure Syllabus

		and goals		6	0	0
Module 2	Formulation of stiffness matrices and transformation matrices for simple elements	The formulation of structural stiffness, assembly of elements can be learnt. The displacement, force formulation can also be established in finite element.		6	0	0
Module 3	Implementation details- assembly of element matrices, force vectors and extraction of element-end displacements, band-width minimization, etc.			4	0	0
Module 4	Basic equations of elasticity and material constitutive relationships			2	0	0
Module 5	Finite element formulations. Isoparametric elements for plane strain, plane stress and torsion less axisymmetric analysis	The students can learn the different types of elements and analysis of axisymmetric members.		9	0	0
Module 6	Formulation of mass and damping matrices	The mass and damping formulation can be leant. Different methods applied in finite element analysis can be learnt by the students.		2	0	0
Module 7	Dynamic equilibrium equation and methods of solution for seismic loading			2	0	0
Module 8	Accuracy and mesh-locking aspects in plane strain and plain stress analysis introduction to mixed formulation and Selective Reduced integration and Uniform Reduced Integration Techniques			3	0	0
Module 9	Brief introduction to the following topics-Fourier methods for analysis of folded plates and of axisymmetric structures subjected to non-axisymmetric loads;	The students will leant the non-axisymmetric loads		3	0	0
Module 10	Geometric non-linearity; material non-linearity	The students will know the concept of degree of freedom, geometric non linear property of materials.		2	0	0
Module 11	Node numbering to reduce band width and degrees of freedom;			2	0	0
Module 12	Plate elements; shell elements, soil-structure interaction;			2	0	0
Module 13	Modeling of unbounded	The students can understand		3	0	0

DEPARTMENT OF CIVIL ENGINEERING

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M.Tech Structure Syllabus

		media and singularities;	the structural interaction between the members			
Module 14		Soil-structure-fluid coupled analysis		2	0	0
	Total			45		

Evaluation Criteria: (Weightage: Theory -25%; Practical design problems -75%)

- 3 Unit tests: 20% each (average score)
- Mid Term Examination: 30%
- End Term Examination: 50%

Learning Outcomes:

Student will acquire the knowledge of discretization of large body into smaller parts and doing the analysis of stress and strains in micro level. The knowledge will enable the students to further study the deformation and stability of structures. The importance of boundary conditions and the equilibrium conditions of the body will also be leant by the students.

Text Books

1. Concepts and Applications of finite Element Analysis, Third Edition (1989), by R.D. Cook, D.S,. Malkus, and M.E. Plesha, John Wiley & Sons.
2. The finite Element Method-Linear Static and Dynamic Finite Element Analysis by T.J.R. Hughes, Prentice-Hall
3. Finite Element Procedures, (1996), by K.J. Bathe, Prentice Hall

References

1. Dynamics of Structures, Second Edition (1993), by R.W. Clough, and J. Penzaien, McGraw-Hill
2. Techniques of finite Elements (1986), by B Irons and S. Ahmed, Ellis Horwood Limited
3. Finite Element Method (1993), G. Prathap, Kluwer Academic Publishers.

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National Institute of Technology, Manipur

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Course Title: Advanced Concrete Technology					
Course Code: CE 557	**No.of Credits:**6		**L:T:P:**3-0-0		**Learning hours:** 45
Pre-requisite Course Code and title (if any): Building materials, Design of RCC Concrete					
Department: Department of Civil Engineering			**Programme: MTech/PhD**		
Course Co-ordinator/instructor:					
Course Type: Core			**Course offered in :** Semester I		

Course Description:

This course will provide the students with state-of-the art knowledge on durable and sustainable cement and concrete, on the various mineral additions and chemical admixtures to enhance the workability, strength, durability and sustainability of concrete, and will empower them in the decision making process regarding the various concrete products, construction procedures and performance test methods that will improve the durability and sustainability of concrete civil infrastructure.

Course Objectives:

To be able to identify Quality Control tests on concrete making materials. To understand the behavior of fresh and hardened concrete. To be able to design concrete mixes as per IS and ACI codes. To understand the durability requirements of concrete. To understand the need for special concretes.

Course Content:

UNIT I	Topic	CO	L	T	P
Module 1	Concrete materials: Cement Production, Types, Tests, Standards, Hydration chemistry; Concrete science, Standards and specifications, Mix Design, Chemical admixtures, Mineral admixtures	CO1: The students should be having a proper and in-depth understanding of the building materials in used in the constructions of the civil engineering structures used in the normal and adverse situations.	6	0	
Module 2	Aggregates Geology of concrete aggregates, Tests and standards; Admixtures for concrete; Concrete mixture proportioning. Polymer concrete, High volume fly ash concrete, High strength concrete		5	0	
Module 3	Concrete behavior: Properties of fresh concrete; Mechanical behavior of concrete; Self-compacting concrete, Reactive powder concrete, Mass concrete	CO2: The students should be able to distinguish between the properties of the fresh and hardened concrete; interpret the deterioration chronology of the hardened concrete.	8	0	
Module 4	Deterioration mechanisms, assessment and control of corrosion in concrete structures, in situ assessment of concrete structures		6		
UNIT II					
Module 5	Durability of concrete. Special topics: Special cement and concrete; Advances in concrete construction; Roller compacted concrete, Oil well concrete	CO3: The students are expected to be exposed to different types of characteristics of special concrete.	7	0	
Module 6	Non-destructive evaluation of concrete structures; Cement based composites; Fracture mechanics of concrete. Durability and fire hazards in concrete.	CO4: The students should be able to perform non-destructive evaluation of concrete structures. Also they should be able to prepare different types of concrete.	5	0	
Module 7	Use of waste materials in concrete, NDT techniques and their applications, repair of concrete structures.		8	0	
	Total (Contact Hours)		45	0	0

Evaluation Criteria: (Weightage: Theory -25%; Practical design problems -75%)

- 3 Unit tests: 20% each (average score)
- Mid Term Examination: 30%
- End Term Examination: 50%

Learning Outcome:

Students will be able to apply the fundamental and advanced concept of concrete properties in solving engineering

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problems.

Recommended Books or Text Book(s):
1. Concrete Materials, Properties, Specification and Testing by S. Popovics, Standard Publishers, India.
2. A.M. Neville, Properties of Concrete, ELBS Ed.
3. Satish Chandra, Waste Materials in Concrete Manufacture, Indian Standard Publishers
4. Bungey, Non-Destructive Testing in Concrete, Surrey University Press, London.
5. Jain, A.K., Reinforced Concrete (Limit State Design).

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Course Title: Foundation Design					
Course Code: CE 559	No.of Credits:6		L:T:P:3-0-0		Learning hours: 45
Pre-requisite Course Code and title (if any): Soil Mechanics, Design of R.C.C Structures					
Department: Department of Civil Engineering			Programme: **MTech**		
Course Co-ordinator/instructor:					
Course Type: Elective			Course offered in : Semester I		

Course Description:
This course uses the basic principles of soil mechanics to design various foundation systems. The principles of statics and mechanics are used to form the necessary tools to solve geotechnical engineering problems concerning design.

Course Objectives:
To learn about types and purposes of different foundation systems and structures. To provide students with exposure to the systematic methods for designing foundations. To discuss and evaluate the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behavior. To build the necessary theoretical background for design and construction of foundation systems.

Course Content:

	Topic	CO	L	T	P
UNIT I					
Module 1	Settlement and bearing capacity: shallow spread footings, mats, and deep foundations;	CO1: The students should be able to understand various types of foundation and also should be able to perform in-situ test (field test of soil).	6	0	
Module 2	Foundation models, contact pressure distribution for footings, raft foundation, Well foundation, Pile foundation.		8	0	
Module 3	Retaining Structures; Soil-structure interaction studies; Case studies.	CO2: The students should be to interpret the effect of the soil-structure interaction from the civil engineering aspects.	6	0	
UNIT II					
Module 4	Critical study of conventional methods of foundation design, analysis of settlement of soil and foundations	CO3: The students should have a proper and in-depth understanding about the analysis and design of varioustypes of foundation.	6		
Module 5	Foundations of in-expensive and swelling soils	CO4: The students should be able to understand the appropriate reason behind the structure and foundation failure.	5	0	
Module 6	Theory of vibrations, liquefaction of soils, coffer dams, types and design principles		6	0	
Module 7	Underpinning of foundations, design of bridge abutments, three dimensional consolidation and theory of sand drains, reinforced earth and its applications.	CO5: The students should be able to perform the analysis and design of the sheet piles and also to interpret advanced geotechnical phenomenon.	8	0	
	Total (Contact Hours)		45	0	0

Recommended Books or Text Book(s):
1. Kasmalkar, J.B. (1997). Foundation Engineering, Pune VidyarthiGraha Prakashan-1786, Pune-411030. Bowels, Joseph E.(1996). Practical Foundation Engineering Handbook. 5th edition, McGraw-Hill, New York.
2. Das, Braja M. (1999). Principles of foundation Engineering, 4th edition, PWS publishing, Pacific Grov. Calif.
3. Peck, Ralph B., Hansen, Walter E., and Thornburn, Thomas H. (1974). Foundation Engineering. John Wiley & Sons, New York.
4. Praksh, Shamsher, and Sharma, Hari D. (1990). Pile foundation in Engineering Practice, John Wiley & Sons, New York.
5. Som, N.N., and Das, S.C. (2003). Foundation Engineering: Principles and Practice. Prentice –Hall of India Pvt. Ltd. New Delhi-001.
6. Varghese, P.C. (2005). Foundation Engineering Prentice –Hall of India Pvt. Ltd. New Delhi-001.
7. Tomlonson, Michael J. (1995). Foundation Design and Construction, 6th edition. John Wiley &Sons, New York.

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Course Title: Design of Plates and Shell structures				
Course Code: CE 561	No. of Credits: 6	L:T:P: 3-0-0		Learning hours: 45
Pre-requisite Course Code and title (if any): Solid Mechanics, structural analysis				
Department: Department of Civil Engineering		Programme: M.Tech/PhD		
Course Co-ordinator/instructor:				
Course Type: Elective		Course offered in : Semester I		

Course Description:

This course provides the basic knowledge and understanding of the concept of plate and shell members. The large expansion roof coverage of structural members has been covered. Basic concepts of extra reinforced at a particular area for the extra loads has also been highlighted. The study will covered a broad area of design which has not been under the codal provisions..

Course Objectives:

1) The students will become aware of the different types of shell elements, plate shells.
2) The concepts of thick and thin shell element can also be understand.
3) The formulation of plate theory and thick plate theory can also be understand.
   The students can also understand the constitutive relation between stress strain in the members.

Units	Topics	CO	L	T	p
Module 1	Prismatic folded plate systems. Shell equations. Approximate solutions. Analysis and design of cylindrical shells. Approximate design methods for doubly curved shells.	To know the concepts of plate, shell and cylindrical elements	5	0	0
Module 2	Surfaces - parametric description, curvilinear co-ordinates, first and second fundamental forms, principal curvature co-ordinates, derivatives of unit vectors, equations of Gauss.	To understand the Coordinate systems, equations of gauss	6	0	0
Module 3	Membrane theory of shells: equilibrium equations, applications to shells of revolution under axisymmetric loads, applications to cylindrical shells under asymmetric loads, strain-displacement relations, application in	To establish the theory of shells equation, strain – displacement relation n, axisymmetric loading conditions	6	0	0

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	calculation of displacements.				
Module 4	Bending theory of shells: kinematic assumptions and strain-displacement relations, stress measures and equilibrium equations, constitutive relations, cylindrical shell under axi-symmetric loads, bending of cylindrical shells.	To understand the bending theory of shells, cylindrical shell under axi-symmetric loads, bending of cylindrical shells.	8	0	0
Module 5	Bending theory of flat plates: thin plates, Kirchoff theory - strain displacement relations, stresses and stress resultants.	To establish the theory of plate elements, Kirchoff theory	6	0	0
Module 6	Constitutive equations, equilibrium equations, boundary conditions, derivation of theory from principle of virtual work.	To establish relation of constitutive equations, boundary conditions etc	6	0	0
Module 7	Rectangular plates-solution by double Fourier series, circular plates, edge effects, anisotropic and layered plates, thick plates-Reissner-Mindlin-Naghadi type theories, moderate deflection analysis and buckling of plates	The concept of theory of thick plate shells elements	8	0	0
	Total		45		

Evaluation Criteria: (Weightage: Theory -25%; Practical design problems -75%)

- 3 Unit tests: 20% each (average score)
- Mid Term Examination: 30%
- End Term Examination: 50%

Learning Outcomes:

Students will learnt the differences between plates and shells. The different uses of plate and shells will also learnt. The knowledge of tackling problem in design of extra load at a particular area will also be taken care. The students will also be able to leant the deflection and buckling of plates.

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Suggested reading:

Text Books

1. Theory of Plates and Shells By Timoshenko and Woinowsky-Krieger
2. Design of Thin Shells By Hass A. M.
3. Design and Construction of Concrete Shell Roof ByRamaswamy G. S.

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Course Title: Advanced Computational Lab			
Course Code: CE 535	No. of Credits: 3	L:T:P: 0-0-3	Learning hours: 42
Pre-requisite Course Code and title (if any): Solid Mechanics, structural analysis, RCC and Steel design			
Department: Department of Civil Engineering		Programme: M.Tech/PhD	
Course Co-ordinator/instructor:			
Course Type: Core		Course offered in : Semester I	

Course Description:
This course provides the basic knowledge and understanding of the concept of design of steel and Reinforced cement concrete structural members. The design concepts applications in terms of softwares like SAP2000, ETABS has been highlighted. Application of Matlab software has also been included.

Course Objectives:
1) The objective of the subject is to expose the students for the design software's available in the industry and research area of structural engineering.
2) The students will also be learning the reliability of the design methods.
3) The Matlab software will also be taught to the students for its applicability to structural members.

Units	Topics	CO	L	T	P
#	Basic design concepts of steel and RCC structures (Codes and manuals)	The students will understand the need of softwares for the design of structures	0	0	3
#	Application of software's like Staadpro, Sap2000, Etabs etc in structure		0	0	9
#	Design of building structures under earthquake loads	The student will know the application of software in design of building	0	0	6
#	Analysis for stresses and strains in structures	The stresses and strain in structures can be anlysed	0	0	6
#	Application of Matlab in structural design	Matlab software application of softwares in structure can be established	0	0	6
#	Post design analysis of structures	The design outcome and the applicability of the design can	0	0	6

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#	Reliability analysis of design structures	be established	0	0	6
Total			0	0	42

Evaluation Criteria: (Weightage: Theory -25%; Practical design problems -75%)

- 3 Unit tests: 20% each (average score)
- Mid Term Examination: 30%
- End Term Examination: 50%

Learning Outcomes:

Students will acquire the skills of design of complex structures using the softwares for design like SAP2000, Etabs, Staadpro etc. The students will be exposed to the field knowledge while designing building structures. The post analysis of structures will also enable the students to check for the reliability of structures

Texts/References

1. Indian standard codes IS 456, 1983, 13920.
2. International building code
3. Manuals for Staddpro, Etabs softwares
4. Robert E. Melchers, André T. Beck, Structural Reliability: Analysis and Prediction, 2018 John Wiley & Sons Ltd.
5. Matlab manual.

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Course Title: Earthquake Resistant Design of Buildings							
Course Code: CE 552	No. of Credits: 6		L:T:P: 3-0-0		Learning hours: 45		
Pre-requisite Course Code and title (if any): Structural Analysis I and II, Design of R.CC structures and steel structures, Structural Dynamics							
Department: Department of Civil Engineering				Programme: **M.Tech/PhD**			
Course Co-ordinator/instructor:							
Course Type: Core				Course offered in : Semester II			

Course Description:

The vast devastation of engineered systems and facilities during the past few earthquakes has exposed serious deficiencies in the prevalent design and constructions practices. These disasters have created a new awareness about the disaster preparedness and mitigation. with increased awareness came the demand of learning resource material which directly address the requirements of professionals without any circumlocution. while the recommended codes of practice for earthquake resistant design do exist but those only specify a set of criteria for compliance. These design codes throw little light on the basic issue of how to design.

Course Objectives:

1. This course provides the knowledge to develop the basic understanding of the issues as required for correctly interpreting and using the standard codes of practices for earthquake resistant design.
2. Also to present the essentials in clear and concise manner with adequate illustrations, while intentionally steering clear of some of the advanced topics which require more rigorous mathematical treatment.

Course Content:

Module no.		Objective	L	T	P
	Unit-I				
1	Performance of Buildings: Behaviour of various types of buildings in past earthquakes. Modes of failure influence of un-symmetry, infill walls, foundation, soft-story and detailing of reinforcement in buildings.	To understand the basic performance of building under various type of past earthquakes.	5	0	0
2	Philosophy of earthquake resistant design : Design philosophy, design spectrum, elastic and inelastic response spectrum.	To developed the philosophy of earthquake resistant design for response spectrum.	10	0	0
3	Frame-Shear wall buildings: Mathematical modeling of building with different structural systems analysis of frame-shear wall buildings, Analysis of Coupled shear walls, Tubular buildings.	Mathematical modeling of building with different structural systems analysis of frame-shear wall buildings	5	0	0
4	Strength, ductility and energy absorption: Ductility of reinforced concrete members subject to flexure, axial load and shear. Definitions of different types of ductility; Detailing of reinforced concrete members, beams, columns, beam-column joint for ductile behaviors. Detailing of steel buildings for ductile behavior. IS code provisions for earthquake resistant design	To understand the strength, ductility and energy absorption of reinforced concrete members subject to flexure, axial load and shear using IS code provisions for earthquake resistant design.	10	0	0
	Unit-II				
5	Special aspects in multi-story buildings: Effect of torsion, flexible first story. P-Δ effect, soil-structure interaction on building behavior, Drift limitations, Design of multi-story buildings with bracings and infills. Retrofitting of buildings.	To understand the Special aspects in multi-story buildings and mathematical modeling of various building types.	5	0	0
6	Seismic Base isolation of Buildings: Principles of base isolation, different types of bearings and isolation systems. Damping devices. Design of buildings with rubber bearings. Supplemental damping. Application of tuned Mass Damper and Active Mass Damper in Tail Buildings.	To understand the seismic base isolation of buildings using IS code provisions for earthquake resistant design.	5	0	0
7	Masonry Buildings: Earthquake resistant considerations for masonry buildings, Repair, restoration and retrofitting of masonry buildings. IS code provisions for earthquake resistant	To understand the behavior of building considering masonry infill, repair, restoration and retrofitting	5	0	0

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	design.	using IS code for earthquake resistant design.			
	Total (Contact Hours)		45	0	0

Evaluation Criteria: (Weightage: Theory -25%; Practical design problems -75%)
- 3 Unit tests: 20% each (average score)
- Mid Term Examination: 30%
- End Term Examination: 50%

Learning Outcome:
Students will be able to design earthquake resistant building structures by using design codes and basic concepts of building design philosophy.

Recommended Books or Text Book(s):
1. Okamoto, S., Earthquake Engineering
2. Park and Paulay, Reinforced Concrete Structures
3. Booth, Edmund (1994), Concrete Structures in Earthquake
4. Chopra, A.K. (1995), Dynamics of Structures: Theory and Applications to Earthquake Engineering, Prentice Hall.

References
1. Key. D (1988), Earthquake Design Practice for Buildings, Telford Publishers, London
2. Newmark, N.M. and Hall, W.J. (1982), Earthquake Spectra & Design, EERI, CA
3. Park, R. and Paulay, T. (1975) Reinforced Concrete Structures, John Wiley & Sons
4. Paulay, T. and Priestley, M.J.N. (1995), Seismic Design of Reinforced Concrete and Masonry Buildings, John wiley & sons
5. Skinner, robinson and McVerry. An Introduction to Seismic isolation, John Wiley & Sons.
6. Wakabayshi, M. (1986). Design of Earthquake Resistant Buildings, McGraw Hill Masonry Structures

7. Paulay, T. and Priestley, M.J.N..(1995). Seismic Design of Reinforced Concrete and Masonry Buildings, John wiley & Sons.

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Course Title: Continuum Mechanics			
Course Code: CE 564	No. of Credits: 8	L:T:P: 3-1-0	Learning hours: 45
Pre-requisite Course Code and title (if any): Solid Mechanics			
Department: Department of Civil Engineering		Programme: M.Tech/PhD	
Course Co-ordinator/instructor:			
Course Type: Core		Course offered in : Semester II	

Course Description:
This course provides the basic knowledge and understanding of the concept of stresses, strain coming on the structures. The relation of stress-strain , strain displacement has also been included. The plane stress and strain concepts has also been highlighted. The torsional effect on the structural members has been taught.

Course Objectives:
1) The objective of this subject is to to make the students aware of the stresses, strain, displacements occurred in the structures under the application of forces.
2) The stress strain , strain displacement will highlight the effect of applied forces in the structural members.
3) The equilibrium and compatibility condition will enable to analyse the stability of structures

Units	Topics	CO	L	T	P
Module 1	Basic concepts of the theory of continuous media; introduction	To understand the theories of stress and strain occurring in	6	2	0

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	to tensor algebra	structures. The different types of forces and its effects will be understand .			
Module 2	theory of stresses; infinitesimal and finite strains		6	2	0
Module 3	strain-displacement relationships; compatibility; stress-strain relationships	To establish the relation of stress-strain, strain displacement relation. Different concepts of plane stress strain will also be taught	6	2	0
Module 4	boundary value problem in elasticity; plane stress and plane strain case; stress function approaches; plane problems in Cartesian and polar coordinates;	To understand the different types of boundary applicable to structure	6	2	0
Module 5	Elements of plasticity; yield criteria; flow rule and hardening. Plastic stress-strain relationships	Different methods of Hamilton principle, Rayleigh Ritz etc applicability to stress strain relation will also be understand	8	2	0
Module 6	variational methods; Introduction to Hamilton's principles; Rayleigh-Ritz and Weighted residual methods; Introduction to thin plates; stability theory; torsion of non-circular sections.		10	2	0
		Total	42	12	0

Evaluation Criteria: (Weightage: Theory -25%; Practical design problems -75%)

- 3 Unit tests: 20% each (average score)
- Mid Term Examination: 30%
- End Term Examination: 50%

Learning Outcomes:

Student will acquire the knowledge of finding stress, strain, governing equations of structure under different loading. The effect of different boundary concepts under different loading conditions will also be understood by the students.

Texts

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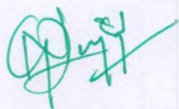## National Institute of Technology, Manipur
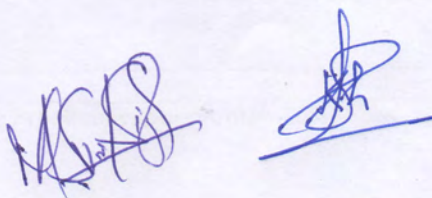Langol, Manipur – 795 004, Ph. (0385)2445812/ e-mail: nitmanipur@yahoo.in
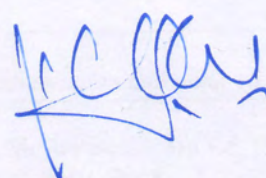An Autonomous Institute under MHRD, Govt. of India

1. D.S. Chandrasekharaiah and L. Debnath, Continuum Mechanics, Prism Books Pvt. Ltd., Bangalore, 1994.
2. L.S. Srinath, Advanced Mechanics of Solids. M.C. Graw Hill Education, 2017.

2. S. Timoshenko and J.N. Goodier, Theory of Elasticity, McGraw Hill Book Company, International Ed, 1970.

References

1. I. H. Shames and F. A. Cozzarellie, Elastic and Inelastic Stress Analysis, Prentice Hall New Jersey 1992.

2. S.P. Timoshenko and S.W. Krieger, Theory of Plates and Shells, McGraw Hill International Ed, 1959.

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Course Title: Advanced Structural Design				
Course Code: CE 562	No.of Credits:6	L:T:P:3-0-0		Learning hours: 45
Pre-requisite Course Code and title (if any):				
Department: Department of Civil Engineering			Programme: **MTech**	
Course Co-ordinator/instructor:				
Course Type: Core			Course offered in : Semester II	

Course Description:
Modelling and strength analysis of complex structures using hand calculation methods and computer analysis. Design of complex structures made from concrete, steel and timber, based on Euro-codes. Methods to control the results of analyzes conducted with data tools. Methodology for assessing environmental impacts and resource use in designing building structures.

Course Objectives:
Basic theories and methods for design of complex building structures based on Indian-codes and other country codes. Principles and methods for design of joints in structural system. How environmental aspects can be included in the choice of materials and structural systems.

Course Content:

UNIT I	Topic	CO	L	T	P
Module 1	Design philosophy, modeling of loads, material characteristics.	CO1: The students should be able to build upon the basic structural design knowledge gained from the undergraduate courses and develop in-depth understanding of the design philosophies.	7	0	0
Module 2	Reinforced Concrete: - P-M, M-phi relationships; strut-and-tie method.		8	0	0
Module 3	Design of deep beam and corbel; design of shear walls; compression field theory for shear design.	CO3: The students should be able to analyze and design advanced civil engineering structures.	8	0	0
UNIT II					
Module 4	Design against torsion; Indian and ACI Standards; Eurocode.	CO3: The students should have a proper understanding of the major design codes used world-wide.	6	0	0
Module 5	Steel structures: - stability design; torsional buckling (pure, flexural and lateral).	CO4: The students should understand and be able to present the fundamentals of various steel structure design problems and also the rigid joint design problems as per the relevant seismic codes.	8	0	0
Module 6	Design of beam-columns; fatigue resistant design; Indian and AISC Standards; Eurocode.		8	0	0
	Total (Contact Hours)		45	0	0

Evaluation Criteria: (Weightage: Theory -25%; Practical/experimental -75%)
- 3 tests: 20% each (average score)
- Mid Term Examination: 30%
- End Term Examination: 50%

Learning Outcomes:
Student will be able to design complex building structures based on Indian-codes and other country codes.

Recommended Books or Text Book(s):
1. S.U. Pillai and D. Menon, Reinforced Concrete Design, Tata McGraw-Hill, 3rd Ed, 1999.
2. N. Subramaniam, Design of Steel Structures, Oxford University Press, 2008.
3. S. Chandrasekaran, L. Nunziante, G. Serino and F. Carannante, Seismic Design Aids for Nonlinear Analysis of Reinforced Concrete Structures, Taylor and Francis, 2010.
4. R. Ranganathan, Structural Reliability: Analysis and Design, Jaico Publishers, 1999.
5. R. Park and T. Paulay, Reinforced Concrete Structures, John Wiley & Sons, 1995.
6. P.C. Varghese, Advanced Reinforced Concrete Design, Prentice Hall of India, 2nd Ed, 2005.

DEPARTMENT OF CIVIL ENGINEERING

M.Tech Structure Syllabus

राष्ट्रीय प्रौद्योगिकी संस्थान,मणिपुर

National Institute of Technology, Manipur

Langol, Manipur – 795 004, Ph. (0385)2445812/ e-mail: nitmanipur@yahoo.in

An Autonomous Institute under MHRD, Govt. of India

Course Title: Optimization Methods in Engineering				
Course Code: CE 560	**No.of Credits:**6	**L:T:P:**3-0-0		**Learning hours:** 45
Pre-requisite Course Code and title (if any):				
Department: Department of Civil Engineering		**Programme:** MTech/PhD		
Course Co-ordinator/instructor:				
Course Type: Elective		**Course offered in :** Semester II		

Course Description:

Structural optimization via [multivariable] calculus (of variations). Application of techniques of mathematical programming to optimize trusses, beams, frames, columns, and other structures. Sensitivity calculation of structural response. Approximation techniques and dual and optimality criteria methods.

Course Objectives:

The objectives of this course are for each student to understand how to formulate a structural optimization problem, including defining appropriate design variables, constraints, and objective functions. Understand how structural analysis methods are integrated with optimization methods to synthesize a structural design. Distinguish among sizing, shape, and topology optimization as classes of structural optimization. Comprehend how to calculate sensitivity derivatives.

Course Content:

UNIT I	Topic	CO	L	T	P
Module 1	Introduction to optimization-Definitions, classification, overview of topics.	CO1: The students should be able to understand the theory of optimization methods and algorithms developed for solving various types of optimization problems. Also to enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems.	10	0	0
Module 2	Single variable optimization algorithms – optimality criteria, bracketing methods, region elimination methods, gradient based methods. Root finding using optimization techniques.		10	0	0
UNIT II					
Module 3	Multivariable optimization algorithms – optimality criteria, direct search methods, gradient search methods.	CO2: The students should be able to interpret classical optimization techniques and numerical methods of optimization. Also know the basics of different evolutionary algorithms.	10	0	0
Module 4	Constrained optimization algorithms – Kuhn –Tucker conditions, algorithms for solving Nonlinear optimization problems, LPP.	CO3: The students should be able to apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.	10	0	0
Module 5	Introduction to Genetic algorithms		5	0	0
	Total (Contact Hours)		45	0	**0**

Evaluation Criteria: (Weightage: Theory -25%; Practical design problems -75%)

- 3 Unit tests: 20% each (average score)
- Mid Term Examination: 30%
- End Term Examination: 50%

Learning Outcome:

Students will be able to formulate optimization problems and apply optimization tools in various Engineering Problems.

Recommended Books or Text Book(s):

1. Introduction to Linear and Nonlinear Programming by D.G. Luenberger, Addison Wesley
2. Nonlinear Programming – Theory and Algorithms by M.S Bazara, H.D. Sherali, and Shetty, John Wiley & Sons.
3. Optimization for Engineering Design: Algorithms and Examples by Prof. K. Deb, Prentice Hall of India, New Delhi.

M.Tech Structure Syllabus

Course Title: Structural Health Monitoring				**Learning hours:** 45
Course Code: CE 566	**No.of Credits:**6	**L:T:P:** 3-0-0		
Pre-requisite Course Code and title (if any):				
Department: Department of Civil Engineering			**Programme: MTech/PhD**	
Course Co-ordinator/instructor:				
Course Type: Elective			**Course offered in :** Semester II	

Course Description:
The course will provide the students with in-depth knowledge of technologies in structural health monitoring using smart materials as sensing and actuating elements to interrogate the structures. Damage detection techniques such as wave, impedance, and vibration-based damage detection techniques will be discussed and applied to different types of structures. Advanced signal processing techniques such as wavelet, neural network, principal component analysis will be used to make the damage more quantifiable.

Course Objectives:
The objectives of this course are for each student to identify suitable Sensors & Instruments required in structural health monitoring for in-service performance of structures. Implement fundamental concepts in structural health monitoring. Identify suitable technique for structural condition assessment.

Course Content:

UNIT I	Topic	CO	L	T	P
Module 1	Overview of SHM: Notable Applications of SHM – Aerospace and Civil Applications, Comparison of SHM with Non Destructive Evaluation (NDE), Condition Monitoring (CM), Statistical Process Control (SPC) and Damage Prognosis (DP), Solution Domain for SHM: Damage Detection Process, Statistical Pattern Recognition Paradigm, Operational Evaluation, Data Acquisition and Cleansing, Feature Extraction, Statistical Model Development for Feature Discrimination, Other Damage Indices.	CO1: The students should be able to understand the basic principles used in the study of structural health monitoring.	4	0	0
Module 2	Vibration Control using SHM: Review of FE formulation, Constitutive Relationship, Element Stiffness and Mass Matrices for High Precision Finite Element, Developing Actuator and Sensor Influence Matrix, Estimating Sensor Voltage, Active Control of Damping	CO2: The students should be able to implement the fundamental concepts of structural health monitoring in the analysis of the vibration related problems in engineering.Demonstrate understanding of working principles of sensors and actuators made from smart materials	8	0	0
Module 3	Sensors and Data Measurement: Methods of Experimental Measurement of Stress, Delamination Sensing using Piezo Sensory Layer, Voltage Response from Piezopatch, Electrical Impedance Method. Sensing using Magnetostrictive Sensory Layer, Basics of Magnetization and Hysteresis, Delamination Sensing using Magnetostrictive Sensory Layer. Types of Data, Data Acquisition and Processing.	CO3: The students should be able to develop an understanding of working principles of sensors and actuators made from smart materials.	8		0
UNIT II					
Module 4	Methods to Estimate Modal Parameters from Experimental Data: Operational Modal Analysis (OMA), Eigen Realization Algorithm (ERA), Auto - Regressive Moving Average (ARMA) Model.	CO4: The students should be able to describe and classify various diagnostic methods of structural health monitoring, with their associated advantages and disadvantages, select a viable structural health monitoring methodology for a given application based on available technology	6	0	0
Module 5	Model Updating: Eigen Sensitivity Method, Artificial Neural Network (ANN) Method.		6	0	0

Nabajit Sarkar

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Module 6	Damage Detection: Modal parameter Variations, Modal Strain Energy Change Ratio.	CO5: The students should be able to decide and select the appropriate strengthening & retrofitting techniques to regain the structural strength.	5	0	0
Module 7	Prognosis: Determination of Fragility Curve, Life Estimation of Structure, Retrofitting of Structure.		8	0	0
	Total (Contact Hours)		45	0	**0**

Evaluation Criteria: (Weightage: Theory -25%; Practical design problems -75%)

- 3 Unit tests: 20% each (average score)
- Mid Term Examination: 30%
- End Term Examination: 50%

Learning Outcome:
Students will be able to identify suitable Sensors & Instruments required in structural health monitoring for in-service performance of structures.

Recommended Books or Text Book(s):
1. Smart Materials and Structures, Gandhi and Thompson
2. Structural Health Monitoring: Current Status and Perspectives, Fu Ko Chang
3. Los Alamos Report for Structural Heath Monitoring of Civil Infrastructure.

M.Tech Structure Syllabus

Course Title:	Advanced Structural lab			
Course Code: CE 536	No.of Credits: 3		L:T:P:0-0-3	Learning hours: 45
Pre-requisite Course Code and title (if any):				
Department: Department of Civil Engineering			Programme: **M.Tech/PhD**	
Course Co-ordinator/instructor:				
Course Type: Laboratory			Course offered in : Semester II	

Course Description:

This laboratory course offers students to learn and/or enhance their knowledge on Mix design for high strength concrete, Non destructive evaluation, loading and deflection measurement in a space truss system, experiment on determinate and indeterminate structures, loading and deflection of steel beam, and natural frequencies and mode shapes of structures.

Course Objectives:

1. This laboratory course offers students to learn and/or enhance their knowledge on Mix design for high strength concrete,
2. Non destructive evaluation,
3. Loading and deflection measurement in a space truss system,
4. Experiment on determinate and indeterminate structures,
5. Loading and deflection of steel beam, and
6. Natural frequencies and mode shapes of structures.

Course Content:

Module	Topic	CO	L	T	P
	UNIT I				
1	Mix design for high strength concrete, use of admixture/plasticizer	Able to perform mix design for high strength concrete	0	0	11
2	Non destructive evaluation of strength of concrete/steel specimens	Able to perform Non destructive evaluation of strength of concrete/steel specimens	0	0	11
3	Loading and deflection measurement in a space truss system	Able to perform loading and deflection measurement in a space truss system	0	0	5
4	Experiment on determinate and indeterminate structures	Able to perform experiments on determinate and indeterminate structures	0	0	5
5	Loading and deflection of steel beam	Able to perform loading and deflection measurement of steel beam	0	0	5
6	Natural frequencies and mode shapes of structures	Able to determine experimentally the natural frequencies and mode shapes of structures	0	0	8
	Total (Contact Hours)		0	0	45

Evaluation Criteria: (Weightage: Theory -25%; Practical/experimental -75%)

- 3 tests: 20% each (average score)
- Mid Term Examination: 30%
- End Term Examination: 50%

Learning Outcomes:

Student will be able to execute Mix design, Non destructive evaluation, load-deflection experiments on trusses and beams, determine experimentally determinate and indeterminate structures, natural frequencies and mode shapes of structures.

Texts/References

1. H.G. Harris and G.M. Sabnis, Structural Modeling and Experimental Techniques, 2nd Ed, CRC Press, 1999.
2. E. Bray and R. K. Stanley, Non Destructive Evaluation, CRC Press, 2002.
3. J.W. Dally and W.F. Riley, Experimental Stress Analysis, McGraw Hill, 3rd Ed, 1991.
4. J.F. Doyle, Modern Experimental Stress Analysis, John Wiley and Sons, 2004.
5. P.C. Aitcin, High-Performance Concrete, E & FN SPON, 1998

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Annexure - 3

SYLLABUS

Ph.D Course Work

Discipline: Structural Engineering

1st Semester

Subject Code	Subject	L	T	P	C
CE 551	Structural Dynamics	3	0	0	6

2nd Semester

Subject Code	Subject	L	T	P	C
CE 552	Earthquake Resistant Design of Buildings	3	0	0	6

Code: CE-551	Structural Dynamics	L T P C
		3 0 0 6

	TOPICS	HOURS
#	Sources of vibration, types of excitation; spring action and damping : Degrees of freedom; Application of Newton's laws, D'Alembert's principle	2
#	Single degree of freedom systems: Mathematical model of physical systems; Free vibrations of undamped and viscously damped systems; Coulomb damping material and radiation damping	5
#	Response of viscously damped SDOF systems to harmonic excitations. Vibration isolation-Vibration arrest trench, Force transmissibility and base motion; Principle of vibration measuring instruments; Equivalent viscous damping structural damping	5
#	Numerical evaluation of dynamic response of linear and non-linear systems	3
#	Frequency domain analysis	3
#	Multiple degree of Freedom systems: Vibrations of undamped 2 DOF systems; Response of 2 DOF to harmonic excitation, mode superposition, vibration absorber	4
#	Lagranges equations and their application to lumped parameter models of MDOF. Free vibrations of MDOF systems, methods of solving eigen	7

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	value problems; iteration methods	
#	Dynamic response of MDOF systems – mode superposition method	3
#	Vibrations of Continuous systems: Free vibrations of continuous systems-axial transverse vibrations of beams. Numerical schemes for obtaining frequencies and mode shapes, vibration of elastic half space (Richart and Hall idealization)	4
#	Response of beams to harmonic excitation	2
#	Earthquake Response of Systems : Response of SDOF and MDOF systems to earthquake excitation. Response spectra; Fourier spectra	3
	Total	**45**

Suggested reading:

Text Books

1. Dynamics of Structures, Second Edition (1993), by R.W. Clough, and J. Penzien, McGraw-Hill
2. Chopra, A.K. (1995), Dynamics of Structures: Theory and Applications to Earthquake Engineering Prentice Hall

References

1. Craig. R.R. Structural Dynamics, John Willey
2. Thomson, W.T. Theory of Vibrations, 3rd Edition, CBS Publishers, New Delhi

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Code: CE-552	Earthquake Resistant Design of Buildings	L T P C
		3 0 0 6

	TOPICS	HOURS
#	Performance of Buildings: Behavior of various types of buildings in past earthquakes. Modes of failure influence of unsymmetry, infill walls, foundation, soft-story and detailing of reinforcement in buildings.	5
#	Philosophy of earthquake resistant design : Design philosophy, design spectrum, elastic and inelastic response spectrum	10
#	Frame-Shear wall buildings: Mathematical modeling of building with different structural systems analysis of frame-shear wall buildings, Analysis of Coupled shear walls, Tubular buildings.	5
#	Strength, ductility and energy absorption: Ductility of reinforced concrete members subject to flexure, axial load and shear. Definitions of different types of ductility; Detailing of reinforced concrete members, beams, columns, beam-column joint for ductile behaviors.	10

Detailing of steel buildings for ductile behavior. IS code provisions for earthquake resistant design

#	Special aspects in multi-story buildings: Effect of torsion, flexible first story. P-Δ effect, soil-structure interaction on building behavior, Drift limitations, Design of multi-story buildings with bracings and infills. Retrofitting of buildings.	5
#	Seismic Base isolation of Buildings: Principles of base isolation, different types of bearings and isolation systems. Damping devices. Design of buildings with rubber bearings. Supplemental damping. Application of tuned Mass Damper and Active Mass Damper in Tail Buildings.	5
#	Masonry Buildings: Earthquake resistant considerations for masonry buildings, Repair, restoration and retrofitting of masonry buildings. IS code provisions for earthquake resistant design.	5
	Total	**45**

Suggested readings:

Text Books

1. Okamoto, S., Earthquake Engineering
2. Park and Paulay, Reinforced Concrete Structures
3. Booth, Edmund (1994), Concrete Structures in Earthquake
4. Chopra, A.K. (1995), Dynamics of Structures: Theory and Applications to Earthquake Engineering, Prentice Hall.

References

1. Berg. G.V. (1982), Seismic Design Codes and Procedures, EERI, CA
2. Key. D (1988), Earthquake Design Practice for Buildings, Telford Publishers, London
3. Newmark, N.M. and Hall, W.J. (1982), Earthquake Spectra & Design, EERI, CA
4. Park, R. and Paulay, T. (1975) Reinforced Concrete Structures, John Wiley & Sons
5. Paulay, T. and Priestley, M.J.N. (1995), Seismic Design of Reinforced Concrete and Masonry Buildings, John wiley & sons
6. Skinner, robinson and McVerry. An Introduction to Seismic isolation, John Wiley & Sons.
7. Wakabayshi, M. (1986). Design of Earthquake Resistant Buildings, McGraw Hill Masonry Structures
8. Paulay, T. and Priestley, M.J.N..(1995). Seismic Design of Reinforced Concrete and Masonry Buildings, John wiley & Sons.
9. Dowrick, D.J. (1987), Earthquake Resistant Design for engineers and Architects, John wiley & Sons, 2nd edn.
10. Engelkirk, R (1995), Steel Structures, Prentice Hall

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SYLLABUS

Ph.D Seminar Course Work

Discipline: Structural Engineering

1st Semester

Subject Code	Subject	Credit
CE 553	Finite Element Methods for Static and Dynamic Problems (Seminar)	4

2nd Semester

Subject Code	Subject	Credit
CE 556	Optimization Methods in Engineering (Seminar)	4
CE 558	Structural Health Monitoring (Seminar)	4

Code: CE-553   Finite Element Methods for Static and Dynamic Problems   Credit

4

\#   Introduction to Finite Element Model-concept of nodes and elements, types of analysis and goals

\#   Formulation of stiffness matrices and transformation matrices for simple elements

\#   Implementation details-assembly of element matrices, force vectors and extraction of element-end displacements, band-width minimization, etc.

\#   Basic equations of elasticity and material constitutive relationships

\#   Finite element formulations. Isoparametric elements for plane strain, plane stress and torsion less axisymmetric analysis

\#   Formulation of mass and damping matrices

\#   Dynamic equilibrium equation and methods of solution for seismic loading

\#   Accuracy and mesh-locking aspects in plane strain and plain stress analysis introduction to mixed formulation and Selective Reduced integration and Uniform Reduced Integration Techniques

\#   Brief introduction to the following topics-Fourier methods for analysis of folded plates and of axisymmetric structures subjected to non-axisymmetric loads;

\#   Geometric non-linearity; material non-linearity

\#   Node numbering to reduce band width and degrees of freedom;

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\# Plate elements; shell elements, soil-structure interaction;

\# Modeling of unbounded media and singularities;

\# Soil-structure-fluid coupled analysis

Suggested readings:

Text Books

1. Concepts and Applications of finite Element Analysis, Third Edition (1989), by R.D. Cook, D.S,. Malkus, and M.E. Plesha, John Wiley & Sons.
2. The finite Element Method-Linear Static and Dynamic Finite Element Analysis by T.J.R. Hughes, Prentice-Hall
3. Finite Element Procedures, (1996), by K.J. Bathe, Prentice Hall

References

1. Dynamics of Structures, Second Edition (1993), by R.W. Clough, and J. Penzaien, McGraw-Hill
2. Techniques of finite Elements (1986), by B Irons and S. Ahmed, Ellis Horwood Limited
3. Finite Element Method (1993), G. Prathap, Kluwer Academic Publishers.

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Code: CE-556	**Optimization Methods in Engineering**	Credit
		4

TOPICS

\# Introduction to optimization-Definitions, classification, overview of topics.

\# Single variable optimization algorithms – optimality criteria, bracketing methods, region elimination methods, gradient based methods. Root finding using optimization techniques.

\# Multivariable optimization algorithms – optimality criteria, direct search methods, gradient search methods.

\# Constrained optimization algorithms – Kuhn –Tucker conditions, algorithms for solving Nonlinear optimization problems, LPP.

\# Introduction to Genetic algorithms

Reference Books:

Text Books and References

1. Introduction to Linear and Nonlinear Programming by D.G. Luenberger, Addison Wesley
2. Nonlinear Programming – Theory and Algorithms by M.S Bazara, H.D. Sherali, and Shetty, John Wiley & Sons.
3. Optimization for Engineering Design: Algorithms and Examples by Prof. K. Deb, Prentice Hall of India, New Delhi.

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Code: CE-558	Structural Health Monitoring	Credit
		4

TOPICS

\# Overview of SHM: Notable Applications of SHM – Aerospace and Civil Applications, Comparison of SHM with Non Destructive Evaluation (NDE), Condition Monitoring (CM), Statistical Process Control (SPC) and Damage Prognosis (DP), Solution Domain for SHM: Damage Detection Process, Statistical Pattern Recognition Paradigm, Operational Evaluation, Data Acquisition and Cleansing, Feature Extraction, Statistical Model Development for Feature Discrimination, Other Damage Indices.

\# Vibration Control using SHM: Review of FE formulation, Constitutive Relationship, Element Stiffness and Mass Matrices for High Precision Finite Element, Developing Actuator and Sensor Influence Matrix, Estimating Sensor Voltage, Active Control of Damping

\# Sensors and Data Measurement: Methods of Experimental Measurement of Stress, Delamination Sensing using Piezo Sensory Layer, Voltage Response from Piezopatch, Electrical Impedance Method. Sensing using Magnetostrictive Sensory Layer, Basics of Magnetization and Hysteresis, Delamination Sensing using Magnetostrictive Sensory Layer. Types of Data, Data Acquisition and Processing.

\# Methods to Estimate Modal Parameters from Experimental Data: Operational Modal Analysis (OMA), Eigen Realization Algorithm (ERA), Auto - Regressive Moving Average (ARMA) Model.

\# Model Updating: Eigen Sensitivity Method, Artificial Neural Network (ANN) Method.

\# Damage Detection: Modal parameter Variations, Modal Strain Energy Change Ratio.

\# Prognosis: Determination of Fragility Curve, Life Estimation of Structure, Retrofitting of Structure.

Suggested readings:

Text Books and References

1. Smart Materials and Structures, Gandhi and Thompson
2. Structural Health Monitoring: Current Status and Perspectives, Fu Ko Chang
3. Los Alamos Report for Structural Heath Monitoring of Civil Infrastructure.

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Standard operating Procedure (SOP)
ONLINE CLASS
Pandemic Covid 19 (Jan – July 2022)

Mode of Teaching for Theory

- The mode of teaching for theory subjects will be conducted through live classes via Webex/Google Meet/Zoom or any suitable app as per time Table.
- Assignments and Unit tests submission will be done via Google classroom.

Mode of Teaching for Practical classes

- Live demonstration (or recorded demonstration, in case of unavoidable situation) of each experiment will be conducted via Webex/Google Meet/Zoom or any suitable app for practical lab classes.
- All Lab manuals to be emailed prior to the experiment
- virtual Lab (which is An Initiative of Ministry of Human Resource Development Under the National Mission on Education through ICT)

All the Study Material should be sent / email to all the students before the Classes

- Contents
- Syllabus in Break ups with schedule plan (Lecture nos)
- Solved problems
- Unsolved problems

Mode of Assessment

- In a semester, there should be at least 05 assignments for each theory subject.
- Assignments can be in the form of MCQ, fill-in-the-blank, or open-book etc., as the subject demand and should be submitted within certain amount of allocated time.
- For practical courses, students will have to submit experimental procedure and theory write-ups after each experiment and before moving on for next experiment.
- Number of unit tests per semester will be as per academic calendar of the institute.
- Mid Term and End Term Examinations and also mark distribution will also be as per the institute norms.
- Mark Distribution:
- Theory Paper: (i) Unit test: 20 marks ; (ii) Mid term: 10 (students conduct) + 10 (Viva) + 10 (Exam) = 30 marks (iii) End term: 10 Marks (Conduct) + 20 (Theory) + 20 (Viva)
- Practical Paper: 10 (Record + Attendance) + 20 (Exam) + 20 (Viva)

All Weblinks materials like MOOCS, NPTEL etc has to be referred.

Academic Calendar
B.Tech. 1st Year
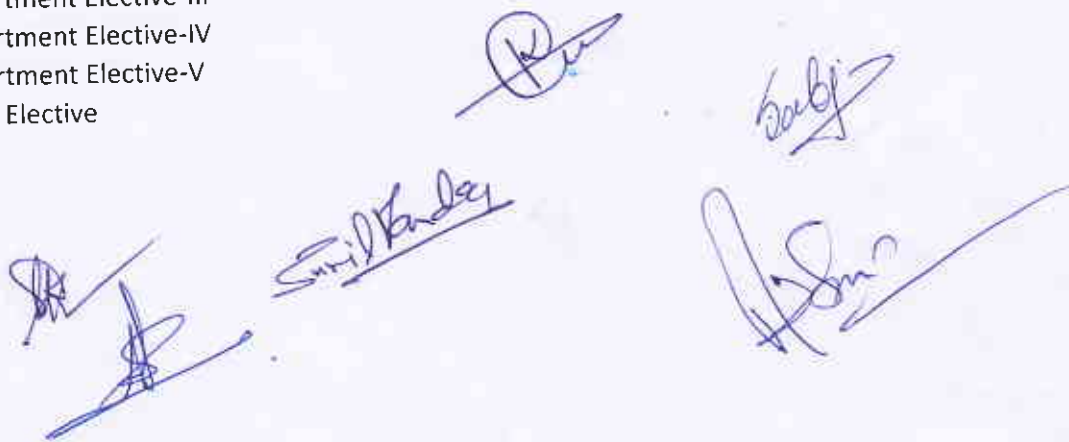## December 2021- March 2022
(Online Classes due to Covid-19)

Sl. No.	Name	Semester (November-March)
1.	Registration of 1st Semester UG students	As per JOSAA / CSAB
2.	First instruction day for Fresh B.Tech students	13th December 2021
3.	Starting of Online Classes	13th December 2021
4.	Mid Semester Examination (MSE) Theory	31st Jan 22 – 04th Feb 2022
5.	Last day of Instruction	11th March 2022
6.	Laboratory End Semester Examination	28th Feb - 04th March 2022
7.	End Semester Examination (ESE) Theory	14th - 18th March 2022
8.	Last date for showing evaluated ESE answer scripts to the B.Tech. students	Before 24th March 2022
9.	Last date of submission of grades to Academic Section	28th March 2022

CODE STRUCTURE: XX-Y-M-N

Sr No		
	CODE STRUCTURE: XX-Y-M-N	
1	XX	CE, ME, EE, EC, CS, MA, CH, PH, HS
2	B. Tech 1st Year	Y=1
3	B. Tech 2nd Year	Y=2
4	B. Tech 3rd Year	Y=3
5	B. Tech 4th Year	Y=4
6	M.Sc. 1st Year	Y=5
7	M.Sc. 2nd Year	Y=6
8	M. Tech. 1st Year	Y=5
9	M. Tech 2nd Year	Y=6
10	Ph.D.	Y=7
11	B. Tech./ M.Sc./M.Tech. /Ph.D. Theory courses	M=0-1 First Start with M=0
12	Projects.	M=2
13	Lab courses	M=3
14	Seminar course subjects	M=4
15	**Electives:** Departments / Open	M=5-9 First Start with M=5
16	B. Tech./M.Sc./M. Tech **Odd Semester** Theory/Lab/Seminar/project courses	N=1, 3, 5, 7, 9 First Start with N=1
17	B. Tech./M.Sc./M. Tech **Even Semester** Theory/Lab/Seminar/project courses	N= 0, 2, 4, 6, 8 First Start with N=2 / N=0 if M=1
18	B. Tech./M.Sc./M. Tech. **Odd Semester** Electives	N=1, 3, 5, 7, 9 First Start with N=1
19	B. Tech./ M.Sc./M. Tech. **Even Semester** Electives	N= 0, 2, 4, 6, 8 First Start with N=0
20	Ph.D. Theory/Lab/Seminar	N=0,1,2,3,4,5,6,7,8,9 First Start with N=1 / N=0 if M=1

Departments are also requested to prepare the following list of electives for B.Tech. , M.Tech. and M.Sc. courses.

1. Department Elective-I
2. Department Elective-II
3. Department Elective-III
4. Department Elective-IV
5. Department Elective-V
6. Open Elective

B-Tech.

1st Year B-tech syllabus in NIT MANIPUR

Semester Group I

Sl	Code	Subject	L	T	P	C
1	CH101	ENGINEERING CHEMISTRY	3	0	0	6
2	EC 101	BASIC ELECTRONICS ENGINEERING	3	0	0	6
3	HS101	COMMUNICATION SKILLS	2	0	0	4
4	MA 101	ENGINEERING MATHEMATICS –I	3	0	0	6
5	ME101	ENGINEERING MECHANICS	3	1	0	8
PRACTICAL						
6.	CH131	ENGINEERING CHEMISTRY LABORATORY	0	0	2	2
7	ME131	WORKSHOP	0	0	3	3
8	ME133	ENGINNERING DRAWING	1	0	3	5
9	SA101	NCC/NSS/ NSO II	0	0	2	0

Semester Group II

Sl	Code	Subject	L	T	P	C
1	CE101	ENVIRONMENTAL STUDIES3	2	0	0	4
2	CS 101	INTRODUCTION TO COMPUTING	3	0	0	6
3	EE101	BASIC ELECTRICAL ENGINEERING	3	0	0	6
4	MA 102	ENGINEERING MATHEMATICS – II	3	0	0	6
5	PH101	ENGINEERING PHYSICS	3	0	0	6
PRACTICAL						
6	CS131	COMPUTING LABORATORY	0	0	4	4
7	EE131	BASIC ELECTRICAL LABORATORY	0	0	3	3
8	PH131	ENGINNERING PHYSICS LABORATORY	0	0	3	3
9	SA101	NCC/NSS/ NSO II	0	0	2	0

Kh. Sachidananda

B

सिविल इंजीनियरिंग विभाग
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No. NITM.8/(06–Estt)/Corr/2021   Dt: 16/11/2021

CIVIL ENGINEERING
(Courses & Course Codes)
B.Tech. Syllabus

3rd Semester

Course Code	Course Name	L-T-P-C
MA 201	Mathematics-III	3-0-0-6
CE 201	Solid Mechanics	3-1-0-8
CE 203	Engineering Geology	3-0-0-6
CE 205	Civil Engineering Materials	3-0-0-6
CE 207	Surveying	3-0-0-6
CE 231	Civil Engineering Materials Lab	0-0-3-3
CE 235	Surveying Laboratory	0-0-3-3
CE 233	Building Drawing and CAD Lab.	1-0-2-4
SA 201	NCC/NSS/NSOI	0-0-2-0
	Total Credits	16-1-8-42

4th Semester

Course Code	Course Name	L-T-P-C
MA 204	Numerical Methods	3-0-0-6
CE 202	Structural Analysis-I	3-1-0-8
CE 204	Environmental EngineeringI	3-0-0-6
CE 206	Geotechnical EngineeringI	3-0-0-6
CE 208	Hydrology and Water Resources Engineering	3-0-0-6
CE 232	Environmental EngineeringLab	0-0-3-3
CE 234	Geotechnical Engineering-I Lab	0-0-3-3
SA 202	NCC/NSS/NSOII	0-0-2-0
	Total Credits	15-1-6-38

5th Semester

Course Code	Course Name	L-T-P-C
CE 301	Structural Analysis-II	3-1-0-8
CE 303	Environmental Engineering-II	3-0-0-6
CE 305	Geotechnical Engineering-II	3-0-0-6
CE 307	✗ ~~Fluid Statics & Dynamics~~ ENGG. FLUID MECHANICS	3-0-0-6
CE 309	Reinforced Concrete Design	3-0-0-6
CE 331	Geotechnical Engineering-II Lab	0-0-3-3
CE 333	~~Fluid Statics & Dynamics Lab~~ ENGG. FLUID MECHANICS LAB.	0-0-3-3
	Total Credits	15-1-6-38

सिविल इंजीनियरिंग विभाग
DEPARTMENT OF CIVIL ENGINEERING
राष्ट्रीय प्रौद्योगिकी संस्थान मणिपुर
NATIONAL INSTITUTE OF TECHNOLOGY MANIPUR
An Autonomous Institute under Ministry of Education, Govt. of India
Langol, Lamphelpat, Imphal – 795004
☏ (0385) 2413031 ✉ hodcivil@nitmanipur.ac.in

6th Semester

Course Code	Course Name	L-T-P-C
HS 302	MME	2-0-0-4
CE 302	Transportation Engineering-I	3-0-0-6
CE 304	Construction Technology and Management	3-0-0-6
CE 306	Design of Steel Structures	3-1-0-8
CE 308	Hydraulics and Hydraulic Structures	3-0-0-6
CE 332	Transportation Engineering-I Laboratory	0-0-3-3
CE 334	Hydraulics and Hydraulic Structures Lab	0-0-3-3
	Total Credits	**15-1-6-36**

7th Semester

Course Code	CourseName	L-T-P-C
HS401	Industrial Management	2-0-0-4
CE 401	Transportation Engineering-II	3-0-0-6
CE4xx	Departmental Elective-I	3-0-0-6
CE4xx	Departmental Elective-II	3-0-0-6
CE4xx	Open Elective-I	3-0-0-6
CE 431	Computational Lab.	0-0-3-3
	Total Credits	**14-0-3-31**

8th Semester

Course Code	CourseName	L-T-P-C
CE 4xx	Departmental Elective-III	3-0-0-6
CE 4xx	Departmental Elective-IV	3-0-0-6
CE 4xx	Open Elective-II	3-0-0-6
CE 422	Project	0-0-9-9
	Total Credits	**9-0-9-27**

Departmental Elective Courses

Course Code	Course Name	L-T-P-C
CE 451	Dynamics of Structures	3-0-0-6
CE 452	Mechanics of Composite Materials	3-0-0-6
CE 453	Hydropower Engineering	3-0-0-6
CE 454	Finite Element Methods in Engineering	3-0-0-6
CE 455	Advanced Structural Mechanics	3-0-0-6
CE 456	Prestressed Concrete and Industrial Structures	3-0-0-6
CE 457	Bridge Engineering	3-0-0-6
CE 458	Experimental Stress Analysis	3-0-0-6
CE 459	Pavement Management Systems	3-0-0-6
CE 460	Information Technology in Construction Engineering	3-0-0-6
CE 461	Design of Foundations and Retaining Structures	3-0-0-6

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CE 462	Ground Improvement and Ground Engineering	3-0-0-6
CE 463	Quantitative Methods in Construction Management	3-0-0-6
CE 464	Hydraulic Machines	3-0-0-6
CE 465	Groundwater Hydrology and Management	3-0-0-6
CE 466	Air Pollution and Industrial Waste Management	3-0-0-6
CE 467	Pavement Design	3-0-0-6
CE 468	Computer Aided Design	3-0-0-6
CE 469	Environmental Management	3-0-0-6
CE 470	**Earthquake Resistant Structure**	3-0-0-6
CE 471	Solid Waste Engineering	3-0-0-6
CE 472	**Disaster Management**	3-0-0-6
CE 473	**Principles of Remote Sensing**	3-0-0-6

B. TECH (ECE) SYLLABUS

Semester – III			
Course No.	Course Name	L-T-P	Credit
EC201	Network Analysis and Synthesis	3-0-0	6
EC203	Semiconductor Circuit and Devices	3-0-0	6
EC205	Analog Electronic Circuits	3-0-0	6
MA201	Math III	3-0-0	6
HS201	Engineering Economics and Accountant	2-0-0	4
EC231	Network Analysis and Synthesis Lab	0-0-3	3
EC233	Semiconductor Circuit and Devices Lab	0-0-3	3
EC235	Analog Electronic Circuits Lab	0-0-3	3
SA201	NSS/NCC/Sport	0-0-2	0
	Total	14-0-11	37

Semester – IV			
Course No.	Course Name	L-T-P	Credit
EC202	Digital Electronic Circuits	3-0-0	6
EC204	Analog Communication	3-0-0	6
EC206	Electronics and Electrical Measurement & Instrumentation	3-0-0	6
EC208	Signal System Analysis	3-0-0	6
MA202	Probability and Random Process	3-0-0	6
EC232	Digital Electronic Circuits Lab	0-0-3	3
EC234	Analog Communication Lab	0-0-3	3
EC236	Electronics and Electrical Measurement & Instrumentation Lab	0-0-3	3
SA202	NSS/NCC/Sport	0-0-2	0
	Total	15-0-11	39

Semester – V			
Course No.	Course Name	L-T-P	Credit
EC301	Microprocessors System	3-0-0	6
EC303	Digital Communication	3-0-0	6
EC305	Electromagnetic Theory	3-0-0	6
EC307	Digital Signal Processing	3-0-0	6
EC309	Control System Engineering	3-0-0	6
EC331	Microprocessors System Lab	0-0-3	3
EC333	Digital Communication Lab	0-0-3	3
EC337	Digital Signal Processing Lab	0-0-3	3
EC339	Control System Engineering Lab	0-0-3	3
	Total	15-0-12	42

M.TECH. (ELECTRONICS AND COMMUNICATION ENGINEERING)

SEMESTER-I

Course Code	Course Title	L	T	P	C
EC 501	Analog and Digital CMOS IC Design	3	0	0	6
EC 503	Embedded Systems Design	3	0	0	6
EC 505	Modern Wireless Communication	3	0	0	6
EC 507	Signal Processing Algorithms	3	0	0	6
EC 5xx	Elective-I	3	0	0	6
EC 51x	Elective-II (Laboratory Course)	0	0	3	3
		Total:			33

SEMESTER-II

Course Code	Course Title	L	T	P	C
EC 502	Semiconductor IC technology	3	0	0	6
EC 504	Advanced Digital Communication	3	0	0	6
EC 506	Advance Microwave Engineering	3	0	0	6
EC 5xx	Elective-III	3	0	0	6
EC 51x	Elective-IV(Laboratory Course)	0	0	3	3
		Total:			27

SEMESTER-III

Course Code	Course Title	L	T	P	C
EC 611	Project-I	0	0	24	24
		Total:			24

SEMESTER-IV

Course Code	Course Title	L	T	P	C
EC 612	Project-II	0	0	24	24
		Total:			24

Semester–VI

CourseNo.	CourseName	L-T-P	Credit
EC302	VLSI Design	3-0-0	6
EC304	Embedded system	3-0-0	6
EC306	Industrial Electronics	3-0-0	6
EC308	Antenna Design	3-0-0	6
EC310	VHDL	3-0-0	6
EC332	VLSI and VHDL Lab	0-0-3	3
EC334	Embedded system Lab	0-0-3	3
EC336	Industrial Electronics Lab	0-0-3	3
EC338	Antenna Design Lab	0-0-3	3
	Total	15-0-12	42

Semester–VII

CourseNo.	Course Name	L-T-P	Credit
HS401	Industrial Management	2-0-0	4
EC401	Microwave Engineering	3-0-0	6
EC403	Computer Networks	3-0-0	6
EC4xx	Department Elective-I	3-0-0	6
EC4xx	Department Elective-II	3-0-0	6
EC421	Project Work-I	0-0-3	3
EC431	Microwave Engineering Lab.	0-0-3	3
EC433	Computer Networks Lab	0-0-3	3
	Total	14-0-9	37

Semester–VIII

CourseNo.	CourseName	L-T-P	Credit
EC4xx	Department Elective–III	3-0-0	6
EC4xx	Department Elective–IV	3-0-0	6
EC(O)4xx	Open Elective	3-0-0	6
HS402	Professional Ethics	2-0-0	4
EC422	Project Work-II	0-0-9	9
	Total	11-0-9	31

Creditsfor1st Year	80	
Creditsfor ECE(III to VIIISemester)	228	
TotalCredits	**308**	

Department of Electronics & Communication Engineering
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(An Autonomous Institute under MHRD, Govt. of India)

Dated:*10/11/2021*

List of Elective (B.Tech)

Department Elective-I

Course Code	Course Title	L	T	P	C
EC 451	Digital Design	3	0	0	6
EC 453	Advanced Antenna Design	3	0	0	6
EC 455	VLSI DSP	3	0	0	6
EC457	Semiconductor Devices Modeling	3	0	0	0

Department Elective-II

Course Code	Course Title	L	T	P	C
EC 459	Biomedical Instrumentation	3	0	0	6
EC 461	Embedded Systems & Signal Processing	3	0	0	6
EC 463	ASIC Design	3	0	0	6
EC465	Memory Technologies	3	0	0	6

Department Elective-III

Course Code	Course Title	L	T	P	C
EC 462	Wireless and Mobile communication	3	0	0	6
EC 464	RF Circuit Design	3	0	0	6
EC 468	Microwave Filter	3	0	0	6
EC472	Mobile Communication System	3	0	0	6

Department Elective-IV

Course Code	Course Title	L	T	P	C
EC 474	Fiber optics communication	3	0	0	6
EC 476	Introduction to SOC	3	0	0	6
EC 478	Radar System Engineering	3	0	0	6
EC482	Introduction to Information Theory & Coding	3	0	0	6

Open Elective

Course Code	Course Title	L	T	P	C
EC 484	Semiconductor IC Technology	3	0	0	6
EC 486	Research Methodology for Beginners	3	0	0	6

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Annex.–7

Electrical Engineering (EE)_B. Tech.

SEMESTER - III

COURSE NO.	COURSE NAME	L-T-P	CREDIT
EE201	Network Analysis	3-0-0	6
EE203	Semiconductor Devices and Circuits	3-0-0	6
EE205	Analog Circuits	3-0-0	6
MA201	Mathematics –III	3-0-0	6
HS201	Engineering Economics and Accountancy	2-0-0	4
EE231	Network Analysis Laboratory	0-0-3	3
EE233	Semiconductor Devices and Circuits Laboratory	0-0-3	3
EE235	Analog Circuits Laboratory	0-0-3	3
		14-0-9	37

SEMESTER - IV

COURSE NO.	COURSE NAME	L-T-P	CREDIT
EE202	Digital Electronics and Computer Architecture	3-0-0	6
EE204	Electrical Machines –I	3-0-0	6
EE206	Measurement and Instrumentation	3-0-0	6
EE208	Signals and Systems	3-0-0	6
MA204	Numerical Methods	3-0-0	6
EE232	Digital Electronics Laboratory	0-0-3	3
EE234	Electrical Machines-I Laboratory	0-0-3	3
EE236	Measurement and Instrumentation Laboratory	0-0-3	3
		15-0-9	39

SEMESTER – V

COURSE NO.	COURSE NAME	L – T – P	CREDIT
EE301	Power Electronics	3-0-0	6
EE303	Electrical Machines-II	3-0-0	6
EE305	Transmission and Distribution	3-0-0	6
EE307	Control System	3-0-0	6
EE309	Electromagnetic Field Theory	3-0-0	6
EE331	Power Electronics Laboratory	0-0-3	3
EE333	Electrical Machines-II Laboratory	0-0-3	3
MA331	Numerical Methods Laboratory	0-0-3	3
		15-0-9	39

SEMESTER – VI

COURSE NO.	COURSE NAME	L – T – P	CREDIT
EE302	Microprocessor and Applications	3-0-0	6
EE304	Power System Protection	3-0-0	6
EE306	Advance Control System	3-0-0	6
EE308	Renewable Energy Resources	3-0-0	6
EE310	Communication System	3-0-0	6
EE332	Microprocessor Laboratory	0-0-3	3
EE334	Power System Laboratory	0-0-3	3
EE336	Control System Laboratory	0-0-3	3
		15-0-9	39

SEMESTER – VII

COURSE NO.	COURSE NAME	L - T - P	CREDIT
EE401	High Voltage Engineering	3-0-0	6
EE403	Power System Analysis	3-0-0	6
EE4XY	Department Elective-I	3-0-0	6
EE4XY	Department Elective-II	3-0-0	6
EE431	Renewable Energy Laboratory	0-0-3	3
EE421	Project - I	0-0-6	6
		12-0-9	33

X=5,6,7,8,9, Y=1,3,5,7,9

SEMESTER – VIII

COURSE NO.	COURSE NAME	L - T - P	CREDIT
EE402	Power System Operation and Control	3-0-0	6
EE4XY	Department Elective-III	3-0-0	6
EE4XY	Open Elective/ Department Elective-IV	3-0-0	6
HS404	Professional Ethics	3-0-0	6
EE422	Project - II	0-0-8	8
		12-0-8	32

X=5,6,7,8,9, Y=0, 2,4,6,8 except XY≠50

DEPARTMENTAL ELECTIVES

B. Tech. ELECTRICAL ENGINEERING

Department Elective-I

S. No.	COURSE NO.	COURSE NAME	L-T-P	Credit
1.	EE 451	PRINCIPLES OF INDUSTRIAL INSTRUMENTATION	3-0-0	6
2.	EE 453	POWER STATION ENGINEERING	3-0-0	6
3.	EE 455	ELECTRICAL ENGINEERING MATERIALS	3-0-0	6
4.	EE 457	EHV AC TRANSMISSION	3-0-0	6
5.	EE 459	NEURAL NETWORK, FUZZY LOGIC AND EVOLUTIONARY ALGORITHM	3-0-0	6
6.	EE 461	DISCRETE AND NON-LINEAR CONTROL THEORY	3-0-0	6
7.	EE 463	ILLUMINATION ENGINEERING	3-0-0	6
8.	EE 465	INTRODUCTION TO DIGITAL SIGNAL PROCESSING	3-0-0	6

Department Elective-II

S. No.	COURSE NO.	COURSE NAME	L-T-P	Credit
1.	EE 467	UTILIZATION OF ELECTRIC POWER	3-0-0	6
2.	EE 469	ELECTRIC TRACTION AND DRIVES	3-0-0	6
3.	EE 471	NUMERICAL RELAYS	3-0-0	6
4.	EE 473	ADVANCED POWER ELECTRONICS	3-0-0	6
5.	EE 475	HVDC TRANSMISSION	3-0-0	6
6.	EE 477	COMPUTER METHODS IN POWER SYSTEMS	3-0-0	6
7.	EE 479	POWER QUALITY	3-0-0	6
8.	EE 481	DISTRIBUTION SYSTEMS PLANNING & AUTOMATION	3-0-0	6

Department Elective-III

S. No.	COURSE NO.	COURSE NAME	L-T-P	Credit
1.	EE 452	SURGE AND LIGHTNING PROTECTION AND SAFETY DEVICES	3-0-0	6
2.	EE 454	SMART GRID	3-0-0	6
3.	EE 456	POWER MARKET REFORMS	3-0-0	6
4.	EE 458	SOLAR AND WIND POWER	3-0-0	6
5.	EE 460	ELECTRIC AND HYBRID VEHICLES	3-0-0	6
6.	EE 462	MODERN CONTROL SYSTEM	3-0-0	6
7.	EE 464	SOLID STATE DRIVES	3-0-0	6
8.	EE 466	DIGITAL CONTROL SYSTEM	3-0-0	6

Department Elective-IV

S. No.	COURSE NO.	COURSE NAME	L-T-P	Credit
1.	EE468	ENERGY HARVESTING TECHNIQUES	3-0-0	6
2.	EE470	SENSORS AND TRANSDUCERS	3-0-0	6
3.	EE472	ENERGY STORAGE SYSYTEMS	3-0-0	6
4.	EE474	SOFT COMPUTING TECHNIQUES	3-0-0	6
5.	EE476	BIO-MEDICAL INSTRUMENTATION ENGINEERING	3-0-0	6

B.Tech. (CSE) Courses

Second Year

Semester – 3

Course No.	Course Name	L	T	P	C
MA201	Mathematics III	3	0	0	6
CS201	Data Structures	3	0	0	6
CS203	Discrete Structures	3	1	0	8
CS205	Digital Logic Design	3	0	0	6
HS201	Engineering Economics & Accountancy	2	0	0	4
CS231	Data Structures Lab	0	0	3	3
CS235	Digital Logic Design Lab	0	0	3	3
		14	1	6	36

Semester – 4

Course No.	Course Name	L	T	P	C
CS202	Formal Languages and Automata Theory	3	1	0	8
CS204	Algorithms	3	0	0	6
CS206	Computer Organization and Architecture	3	0	0	6
CS208	Object Oriented Programming with JAVA	3	0	0	6
MA202	Probability and Random Processes	3	0	0	6
CS232	Algorithms Lab	0	0	3	3
CS234	Object Oriented Programming with JAVA Lab	0	0	3	3
CS236	Peripherals and Accessories Lab	0	0	3	3
		15	1	9	41

Third Year

Semester – 5

Course No.	Course Name	L	T	P	C
MA301	Optimization	3	0	0	6
CS301	Software Engineering	3	0	0	6
CS303	Operating Systems	3	0	0	6
CS305	Data Communication	3	1	0	8
MA303	Numerical Technique	3	0	0	6
CS331	Software Engineering and System Software Lab	0	0	3	3
CS333	Operating Systems Lab	0	0	3	3
		15	1	9	38

Semester – 6

Course No.	Course Name	L	T	P	C
HS302	Management and Managerial Economics	2	0	0	4
CS302	Databases	3	0	0	6
CS304	Compilers	3	0	0	6
CS306	Computer Networks	3	0	0	6
CS308	Information Storage and Retrieval	3	1	0	8
CS332	Databases Lab	0	0	3	3
CS334	Compilers and System Programming Lab	0	0	3	3
CS336	Computer Networks Lab	0	0	3	3
		14	1	9	39

Syllabus for B.Tech. (CSE)

Final Year

Semester – 7

Course No.	Course Name	L	T	P	C
CS401	Computer Graphics	3	0	0	6
CS403	Machine Learning	3	0	0	6
CS4XX	Department Elective - I	3	0	0	6
CS4XX	Department Elective - II	3	0	0	6
CS4XX	Department Elective - III	3	0	0	6
CS431	Computer Graphics Lab	0	0	3	3
CS433	Machine Learning Lab	0	0	3	3
CS421	Project – 1	0	0	3	9
		15	0	6	45

Semester – 8

Course No.	Course Name	L	T	P	C
CS4XX	Department Elective - IV	3	0	0	6
CS4XX	Department Elective - V	3	0	0	6
CS4XX	Department Elective - VI	3	0	0	6
CS422	Project - II	0	0	0	9
		9	0	0	27

Syllabus for B.Tech. (CSE)

Department Electives

Course ID	Course Name	Credit
CS 452	Optimization methods	6
CS 454	Computation number theory & cryptography	6
CS 456	Information & randomness	6
CS 458	Advanced operating systems	6
CS 460	Information transmission & security	6
CS 462	Topics in networks	6
CS 464	Web development technologies	6
CS466	Big Data	6
CS 468	Wireless networks	6
CS 470	Linux Kernals: Implementation & security	6
CS 472	Enterprise systems	6
CS 474	Performance modelling of communication & computer systems	8
CS 476	Artificial intelligence	8
CS 478	Principles of robotics	6
CS 480	Intelligences systems & interfaces	6
CS 482	Pattern recognition	6
CS 484	Fundamental of information retrieval	8
CS 486	Digital Watermarking	6
CS 488	Steganography	6
CS 490	Video Processing	6
CS492	Natural Language Processing	6
CS494	Cloud Computing	6

Syllabus for B.Tech. (CSE)

Code	Title	Credits
CS 451	Parallel algorithms	6
CS 453	Computational geometry	6
CS 455	Structural complexity	6
CS 457	Hierarchial memory algorithm	6
CS 459	Logic in computer science	6
CS 461	Learning with Kernals	6
CS 463	Computational topology	6
CS 465	Advanced computer architecture	6
CS 467	Formal methods for system verification	6
CS 469	Semantics for programming languages	6
CS 471	Functional & logic programming	6
CS 473	Advanced compilers	6
CS 475	Distributed systems	6
CS 477	Internet protocols	6
CS 479	Wireless sensor networks	6
CS 481	Machine learning	6
CS 483	Data mining	6
CS 485	Multimedia systems	6
CS 487	Human computer interaction	8
CS 489	Computational system biology	6
CS 491	Digital Image Processing	6
CS 493	Mobile robotics	6
CS 495	Computer & network security	6

Annexure-I

SYLLABI

for

B.Tech. Programme

in

Mechanical Engineering

DEPARTMENT OF
MECHANICAL ENGINEERING

National Institute Of Technology Manipur
Imphal - 795001
India

DEPARTMENT OF MECHANICAL ENGINEERING

B. Tech. SYLLABUS

SEMESTER III

Code	Subject	Lecture	Tutorial	Practical	Credit
MA201	Mathematics III	3	0	0	6
ME201	Engineering Thermodynamics	3	1	0	8
ME203	Strength of Materials	3	0	0	6
ME205	Engineering Materials	3	0	0	6
ME207	Fluid Mechanics	3	0	0	6
Practical					
ME231	Machine Drawing	0	0	5	5
ME233	Strength of Materials Lab	0	0	3	3
SA201	NSS 1/NSO 1/NCC 1	0	0	2	0
Total		15	1	10	40

SEMESTER IV

Code	Subject	Lecture	Tutorial	Practical	Credit
MA204	Numerical Methods	3	0	0	6
ME202	Mechanical measurements and Metrology	3	0	0	6
ME204	Kinematics of Machinery	2	1	0	6
ME206	Turbomachines	3	1	0	8
ME208	Manufacturing Technology I	3	1	0	8
Practical					
ME232	Measurements and Metrology Lab	0	0	3	3
ME234	Manufacturing Technology Lab-I	0	0	3	3
ME236	Fluid Mechanics & Turbomachinery Lab	0	0	3	3
SA202	NSS 2/NSO 2/NCC 2	0	0	2	0
Total		14	3	11	43
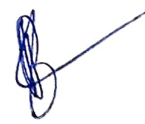
SEMESTER V

Code	Subject	Lecture	Tutorial	Practical	Credit
ME301	Heat and Mass Transfer	3	1	0	8
ME303	Manufacturing Technology II	3	0	0	6
ME305	Dynamics of Machinery	3	1	0	8
ME307	Thermal Engineering I	3	0	0	6
ME309	Design of Machine Elements I	3	0	0	6
Practical					
ME331	Heat Transfer Lab	0	0	3	3
ME333	Manufacturing Technology Lab II	0	0	3	3
ME335	Dynamics of Machines Lab	0	0	3	3
Total		15	2	9	43

SEMESTER VI

Code	Subject	Lecture	Tutorial	Practical	Credit
ME302	Mechatronics	2	1	0	6
ME304	Automobile Engineering	3	0	0	6
ME306	Refrigeration and Air Conditioning	3	0	0	6
ME308	Thermal Engineering II	3	1	0	8
ME310	Design of Machine Elements II	3	1	0	8
Practical					
ME332	Mechatronics Lab	0	0	3	3
ME334	Automobile Engineering Lab	0	0	3	3
ME336	Thermal Engineering Lab	0	0	3	3
Total		14	3	9	43

SEMESTER VII

Code	Subject	Lecture	Tutorial	Practical	Credit
HS401	Industrial Economics	2	0	0	4
ME401	Industrial Engineering and Operations Research	3	0	0	6
ME403	CAD/CAM	3	1	0	8
ME4XX	Departmental Elective I	3	0	0	6
ME4XX	Departmental Elective II	3	0	0	6
Practical					
ME431	CAD/CAM Lab	0	0	3	3
ME421	Project Work I	0	0	3	3
Total		**14**	**1**	**6**	**36**

SEMESTER VIII

Code	Subject	Lecture	Tutorial	Practical	Credit
HS402	Management Principles & Concepts	2	0	0	4
ME4XX	Departmental Elective III	3	0	0	6
ME4XX	Departmental Elective IV	3	0	0	6
XXXXX	Open Elective/ Departmental Elective	3	0	0	6
Practical					
ME422	Project Work II	0	0	9	9
Total		**11**	**0**	**9**	**31**

Credits for I Year   : 80
Credits for Mechanical Engineering (III to VIII Semester)   : 227
Total Credits   : 307

LIST OF DEPARTMENTAL ELECTIVES

DEPARTMENTAL ELECTIVE I

Code	Subject	Lecture	Tutorial	Practical	Credit
ME451	Introduction to Finite Element Method	3	0	0	6
ME453	Energy Conservation	3	0	0	6
ME455	Control Systems	3	0	0	6
ME457	Welding Engineering	3	0	0	6
ME469	Introduction of Two-Phase flow	3	0	0	6
ME471	Elements of Product Design	3	0	0	6
ME473	Materials handling	3	0	0	6
ME475	Elements of Plastic Technology	3	0	0	6
ME477	Production system and control	3	0	0	6

DEPARTMENTAL ELECTIVE II

Code	Subject	Lecture	Tutorial	Practical	Credit
ME459	Introduction to Power Plant Engineering	3	0	0	6
ME461	Advanced Manufacturing Processes	3	0	0	6
ME463	Introduction to Combustion Engineering	3	0	0	6
ME465	Optimization Engineering	3	0	0	6
ME467	Non-Destructive Testing	3	0	0	6
ME481	Introduction of Turbulent Flow	3	0	0	6
ME483	Work System Design	3	0	0	6
ME485	Reliability Engineering	3	0	0	6

DEPARTMENTAL ELECTIVE III

Code	Subject	Lecture	Tutorial	Practical	Credit
ME452	Cryogenics Engineering	3	0	0	6
ME454	Renewable Energy Engineering	3	0	0	6
ME456	Tribology of Bearings	3	0	0	6
ME458	Non-Traditional Machining	3	0	0	6
ME 480	Statistical Process Control	3	0	0	6

DEPARTMENTAL ELECTIVE IV

Code	Subject	Lecture	Tutorial	Practical	Credit
ME460	Industrial Safety	3	0	0	6
ME462	Mechanical Vibration	3	0	0	6
ME464	Introduction to Computational Fluid Dynamics	3	0	0	6
ME466	Introduction to Advanced I. C. Engines	3	0	0	6
ME470	Industrial Quality Management	3	0	0	6

DEPARTMENTAL ELECTIVE V

Code	Subject	Lecture	Tutorial	Practical	Credit
ME468	Robotics & Industrial Automation	3	0	0	6

M-Tech

सिविल इंजीनियरिंग विभाग
DEPARTMENT OF CIVIL ENGINEERING
राष्ट्रीय प्रौद्योगिकी संस्थान मणिपुर
NATIONAL INSTITUTE OF TECHNOLOGY MANIPUR
An Autonomous Institute under **Ministry of Education, Govt. of India**
Langol, Lamphelpat, Imphal – 795004
☎ (0385) 2413031 ✉ hodcivil@nitmanipur.ac.in

M.Tech. Syllabus*
(* subject to M.Tech 3 Specializations after 23rd Senate)

1st Semester

Course Code	Course Name	L-T-P-C
CE 501	Process Chemistry for Water and Wastewater Treatment	3-0-2-8
CE 503	Physio-Chemical Processes in Environmental Engineering	3-0-0-6
CE 505	Geospatial Applications	3-0-2-8
CE 507	Applied Hydrology	3-1-0-8
	Total Credits	**12-1-4-30**

2nd Semester

Course Code	Course Name	L-T-P-C
CE 502	Solid Waste Management & EIA	3-0-0-6
CE 504	Spatial Modelling and Assessment	3-0-2-8
CE 5xx	Departmental Elective-I	3-0-0-6
CE 5xx	Departmental Elective-II	3-0-2-8
	Total Credits	**12-0-4-28**

3rd Semester

Course Code	Course Name	L-T-P-C
CE 621	M. Tech Project- I	0-0-24-24
	TotalCredits	**0-0-24-24**

4th Semester

Course Code	Course Name	L-T-P-C
CE 622	M. Tech Project - II	0-0-24-24
	Total Credits	**0-0-24-24**

Departmental Elective Courses

Electives I

Course Code	Course Name	L-T-P-C
CE 552	Industrial Wastewater Pollution Control	3-0-0-6
CE 554	Air Pollution and Control	3-0-0-6
CE 556	Environmental Management	3-0-0-6
CE 558	Principles of Water Quality and Legislations	3-0-0-6
CE 560	Water Distribution and Wastewater Collection System Design	3-0-0-6

Electives II

Course Code	Course Name	L-T-P-C
CE 562	Biological Process in Environmental Engineering	3-0-0-6
CE 564	Digital Image Processing and Applications	3-0-0-6

सिविल इंजीनियरिंग विभाग

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CE 566	Principles of Photogrammetry	3-0-0-6
CE 568	Hydrometry and Instrumentation	3-0-0-6
CE 570	Hydro Informatics (AI, ANN, ANFIS, etc.)	3-0-0-6
CE 572	River and Lake Conservation	3-0-0-6
CE 574	Flood Modelling and Forecasting	3-0-0-6
CE 576	Biological Process in Environmental Engineering	3-0-0-6
CE 578	**Advanced Hydraulic Engineering**	3-0-2-8
CE 580	**River Dynamics & Engineering**	3-0-2-8
CE 582	Hydro-Meteorology* (External Expert Reqd.)	3-0-0-6
CE 584	Hydrological and Hydraulic Modelling	3-1-0-8
CE 586	Advanced Fluid Mechanics	3-0-2-8
CE 588	Fluvial Hydraulics	3-0-0-6
CE 590	EcoHydraulics & EcoHydrology	3-0-0-6
CE 592	Geospatial Hydrology & Climate Change	3-0-2-8
CE 594	Geoinformatics for Disaster Management (GeoDM)	3-0-0-6
CE 596	Geomatics in Urban Analysis	3-0-0-6
CE 598	**Thermal, Microwave & Hyperspectral Remote Sensing**	3-0-2-8
CE 550	Groundwater Engineering	3-0-0-6

Ph.D. Syllabus

Course Work

Course Code	Course Name	L-T-P-C
CE 701	Structural Dynamics	3-0 0-6
CE 702	Earthquake Resistant Design of Buildings	3-0-0-6

Seminar Courses (PhD)

Course Code	Course Name	L-T-P-C
CE 741	Finite Element Methods for Static and Dynamic Problems	2-0-0-4
CE 742	Optimization Methods in Engineering	2-0-0-4
CE 743	Applications of Mathematical GIS	2-0-0-4
CE 744	Structural Health Monitoring	2-0-0-4
CE 745	Application of Remote Sensing and GIS in Groundwater Modelling	2-0-0-4
CE 746	Introduction to Computational Fluid Dynamics	2-0-0-4

Dr. Ngangbam Romeji
Head of Dept
Department of Civil Engineering

M.TECH. (ELECTRONICS AND COMMUNICATION ENGINEERING)

SEMESTER-I

Course Code	Course Title	L	T	P	C
EC 501	Analog and Digital CMOS IC Design	3	0	0	6
EC 503	Embedded Systems Design	3	0	0	6
EC 505	Modern Wireless Communication	3	0	0	6
EC 507	Signal Processing Algorithms	3	0	0	6
EC 5xx	Elective-I	3	0	0	6
EC 51x	Elective-II (Laboratory Course)	0	0	3	3
		Total:			33

SEMESTER-II

Course Code	Course Title	L	T	P	C
EC 502	Semiconductor IC technology	3	0	0	6
EC 504	Advanced Digital Communication	3	0	0	6
EC 506	Advance Microwave Engineering	3	0	0	6
EC 5xx	Elective-III	3	0	0	6
EC 51x	Elective-IV(Laboratory Course)	0	0	3	3
		Total:			27

SEMESTER-III

Course Code	Course Title	L	T	P	C
EC 611	Project-I	0	0	24	24
		Total:			24

SEMESTER-IV

Course Code	Course Title	L	T	P	C
EC 612	Project-II	0	0	24	24
		Total:			24

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Students can select subjects either from Elective A or B.

List of Electives A

Electives-I

Course Code	Course Title	L	T	P	C
EC551	Advanced Antenna Design	3	0	0	6
EC553	Signal Processing for Embedded Systems	3	0	0	6
EC555	Real Time Operating Systems	3	0	0	6
EC557	Microcontroller for Embedded Systems	3	0	0	6
EC559	Embedded Networking	3	0	0	6
EC561	FPGA Design	3	0	0	6
EC563	VLSIDSP	3	0	0	6
EC565	Digital IC Design	3	0	0	6
EC567	MEMS and Microsystem Technology	3	0	0	6
EC569	Biomedical Signal and Systems	3	0	0	6

Electives-II

Course Code	Course Title	L	T	P	C
EC 531	VLSI and Embedded Lab-I	0	0	3	3
EC 533	Advanced Microwave and Antenna Lab	0	0	3	3

Electives-III

Course Code	Course Title	L	T	P	C
EC552	Low Power VLSI	3	0	0	6
EC554	ASIC Design and Modeling	3	0	0	6
EC556	Embedded Computing	3	0	0	6
EC560	Modeling of Semiconductor Devices	3	0	0	6
EC562	VLSI System Design	3	0	0	6
EC564	VLSI EDA Tools	3	0	0	6
EC566	Reconfigurable Computing	3	0	0	6
EC568	Memory Technologies	3	0	0	6
EC570	Filter Design	3	0	0	6
EC572	CPLD & FPGA Architecture	3	0	0	6
EC574	Research Methodology for Engineers	3	0	0	6

Electives-IV

Course Code	Course Title	L	T	P	C
EC532	VLSI and Embedded Lab-II	0	0	3	3
EC536	System Simulation Lab-A	0	0	3	3

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List of Electives B

Elective-I

Course Code	Course Title	L	T	P	C
EC571	Advance Digital Signal Processing	3	0	0	6
EC573	Mobile Communication	3	0	0	6
EC575	Fiber Optics Communication	3	0	0	6
EC577	Software Defined Radio	3	0	0	6
EC579	Advance Electromagnetic	3	0	0	6
EC581	Antenna for Mobile Applications	3	0	0	6
EC583	Electromagnetic Interference	3	0	0	6
EC585	Modern Digital System Design	3	0	0	6
EC587	Principle of Microwave solid state devices	3	0	0	6

Elective-II

Course Code	Course Title	L	T	P	C
EC535	Signal and Image Processing Lab	0	0	3	3
EC537	Communication System Lab	0	0	3	3

Elective-III

Course Code	Course Title	L	T	P	C
EC574	Information Theory and Coding	3	0	0	6
EC576	Data Communication	3	0	0	6
EC578	Satellite Communication	3	0	0	6
EC580	Advance Radio Communication	3	0	0	6
EC582	System-on-Chip (SoC)	3	0	0	6
EC584	Microwave Devices and Circuits	3	0	0	6
EC586	RF Component & Circuit Design	3	0	0	6
EC588	Radar Engineering	3	0	0	6
EC590	Advance EM Wave Propagation and Antenna	3	0	0	6
EC592	Microwave Filter Design	3	0	0	6
EC594	Image Processing Techniques	3	0	0	6

Elective-IV

Course Code	Course Title	L	T	P	C
EC534	Advanced Communication Lab	0	0	3	3
EC538	Image Processing Lab	0	0	3	3

Jayananda.

Anex. – II

Power and Control System (EE) M. Tech.

First Year

SEMESTER – I

COURSE NO.	COURSE NAME	L - T - P	CREDIT
EE 501	LINEAR SYSTEMS THEORY	3-0-0	6
EE 503	MODERN CONTROL THEORY	3-0-0	6
EE 505	MODERN POWER SYSTEMS	3-0-0	6
EE 507	HVDC AND FACTS	3-0-0	6
EE 5XY	DEPARTMENT ELECTIVE - I	3-0-0	6
EE 531	POWER and CONTROL LAB	0-0-3	3
		15-0-3	33

X=5,6,7,8,9,   Y=1,3,5,7,9 ~~X≠5~~

SEMESTER - II

COURSE NO.	COURSE NAME	L - T - P	CREDIT
EE 502	OPTIMAL AND ADAPTIVE CONTROL	3-0-0	6
EE 504	DIGITAL CONTROL	3-0-0	6
EE 506	ADVANCE POWER SYSTEM PROTECTION	3-0-0	6
EE 508	POWER SYSTEM TRANSIENTS	3-0-0	6
EE 5XY	DEPARTMENT ELECTIVE -II	3-0-0	6
EE 532	ADVANCED POWER AND CONTROL LAB	0-0-3	3
		15-0-3	33

X=5,6,7,8,9, Y=0, 2,4,6,8 except, XY≠50

Second Year

SEMESTER – III

COURSE NO.	COURSE NAME	L - T - P	CREDIT
EE 621	PROJECT - I	0-0-24	24
		0-0-24	24

SEMESTER - IV

COURSE NO.	COURSE NAME	L - T - P	CREDIT
EE 622	PROJECT -II	0-0-24	24
		0-0-24	24

DEPARTMENTAL ELECTIVES

POWER AND CONTROL SYSTEM (EE) M. TECH.

DEPARTMENT ELECTIVE-I

S. No.	COURSE NO.	COURSE NAME	L-T-P	Credit
1.	EE551	ELECTRIC VEHICLES AND CHARGING TECHNOLOGY	3-0-0	6
2.	EE553	ELECTRO MAGNETIC INTERFERENCE AND COMPATIBILITY	3-0-0	6
3.	EE555	POWER SYSTEM STABILITY AND CONTROL	3-0-0	6
4.	EE557	APPLICATIONS OF POWER CONVERTERS	3-0-0	6
5.	EE559	ADVANCED ELECTRIC DRIVES AND CONTROL	3-0-0	6
6.	EE561	DSP CONTROLLED DRIVES	3-0-0	6
7.	EE563	STATE ESTIMATION AND SECURITY ANALYSIS	3-0-0	6
8.	EE565	ALTERNATIVE SOURCES OF ELECTRIC ENERGY	3-0-0	6
9.	EE567	ADVANCED COMPUTER METHODS IN POWER SYSTEMS	3-0-0	6
10.	EE569	AI TECHNIQUES IN POWER SYSTEMS	3-0-0	6
11.	EE571	DESIGN AND TESTING OF HIGH VOLTAGE APPARATUS	3-0-0	6
12.	EE573	ADVANCED DISTRIBUTION SYSTEMS PLANNING AND AUTOMATION	3-0-0	6
13.	EE575	ECONOMIC OPERATION OF POWER SYSTEMS	3-0-0	6
14.	EE577	POWER SYSTEM RELIABILITY AND PLANNING	3-0-0	6
15.	EE579	RENEWABLE ENERGY INTEGRATION FOR EVs	3-0-0	6

DEPARTMENT ELECTIVE-II

S. No.	COURSE NO.	COURSE NAME	L-T-P	Credit
1	EE552	POWER SYSTEM DEREGULATION	3-0-0	6
2	EE554	EHV AC & DC TRANSMISSION	3-0-0	6
3	EE556	ADVANCED SOFT COMPUTING TECHNIQUES	3-0-0	6
4	EE558	MECHATRONICS AND ITS APPLICATION	3-0-0	6
5	EE560	NONLINEAR CONTROL SYSTEMS	3-0-0	6
6	EE562	ROBOTICS AND AUTOMATION	3-0-0	6
7	EE564	MICROPROCESSOR BASED INDUSTRIAL CONTROL INSTRUMENTATION	3-0-0	6
8	EE566	RANDOM PROCESS CONTROL AND ESTIMATION	3-0-0	6
9	EE568	PARAMETER ESTIMATION & SYSTEM IDENTIFICATION	3-0-0	6
10	EE570	ARTIFICIAL NEURAL NETWORKS & FUZZY SYSTEMS	3-0-0	6
11	EE572	ADAPTIVE AND ROBUST CONTROL	3-0-0	6
12	EE574	ADVANCED PROCESS CONTROL	3-0-0	6
13	EE576	ADVANCED DIGITAL SIGNAL PROCESSING	3-0-0	6
14	EE578	IMAGE PROCESSING	3-0-0	6
15	EE580	ADVANCED ELECTRIC TRACTION AND DRIVES	3-0-0	6

Syllabus of M.Tech.(CSE)

SEMESTER – 1

Course No.	Course Name	L-T-P-C
CS501	Advanced data structure and algorithms	3-0-0-6
CS503	Mathematics for Computer Science	3-1-0-8
CS505	Computer Systems & Networks	3-0-0-6
CS5xx	Departmental Elective – I	3-0-0-6
CS531	Programming Lab	0-0-3-3
	Total	13-0-3-29

SEMESTER – 2

Course No.	Course Name	L-T-P-C
CS502	Theory of Computation	3-0-0-6
CS5xx	Departmental Elective – II	3-0-0-6
CS5xx	Departmental Elective – III	3-0-0-6
CS5xx	Departmental Elective – IV	3-0-0-6
CS532	Computer System Lab	0-0-3-3
	Total	12-0-3-27

SEMESTER – 3

Course No	Course Name	L-T-P-C
CS621	Project-I	0-0-24-24
	Total	0-0-24-24

SEMESTER – 4

Course No	Course Name	L-T-P-C
CS622	Project-II	0-0-24-24
	Total	0-0-24-24

Total Credit = 104

M.Tech.(CSE) Courses

Department Electives

Course ID	Course Name	Credit
CS 552	Advanced Optimization methods	6
CS 554	Computational Number Theory and Modern Cryptography	6
CS 556	Algorithmic Information Theory & randomness	6
CS 558	Advanced concepts in operating systems	6
CS 560	Advanced Information transmission & security	6
CS 562	Advanced Topics in networks	6
CS 564	Advanced Web development technologies	6
CS 566	Cryptography and Network Security	6
CS 568	Wireless Communications and Networks	6
CS 570	Linux Kernel Security	6
CS 572	Design of Enterprise systems	6
CS 574	Computer Performance Evaluation	8
CS 576	Computational Principal of Robotics	6
CS 578	Intelligences User Interfaces	6
CS 580	Applied Pattern recognition	6
CS 582	Data analytics & Artificial intelligence	6
CS 584	Advanced information retrieval	8
CS 586	Innovations in Digital Watermarking	6
CS 588	Steganography techniques	6
CS590	Video Processing& communication	6
CS592	Advanced Natural Language Processing	6
CS594	Cloud Computing Technology	6
CS596	Big Data Analytics	6
CS 551	Parallel and Distributed Algorithms	6
CS 553	Computational and Differential geometry	6
CS 555	Complexity Theory	6
CS 557	Hierarchical memory algorithm and Data Structures	6
CS 559	Logic for Computer Science and Applications	6
CS 561	Learning with Kernels and Applications	6

M.Tech.(CSE) Courses

CS 563	Computational Geometry and topology	6
CS 565	Advanced computer architecture and applications	6
CS 567	Formal methods for Hardware Verification	6
CS 569	Formal Semantics for programming languages	6
CS 571	Logic and Functional Programming	6
CS 573	Advances in Compiler Construction	6
CS 575	Advanced Distributed systems	6
CS 577	Computer Networks and Internet protocols	6
CS 579	Principles of Wireless sensor networks	6
CS 581	Multimedia Communication Systems	6
CS 583	Advanced Machine Learning	6
CS 585	Data mining Techniques	6
CS 587	Introduction to Human computer interaction	8
CS 589	Computational and systems biology	6
CS 591	Principles of Digital Image Processing	6
CS 593	Mobile robotics System	6

M.TECH + P.hD
(Thermal Area)

SYLLABI

for

M. Tech. Programme

in

Mechanical Engineering

(Thermal & Fluids Engineering)

DEPARTMENT OF

MECHANICAL ENGINEERING

National Institute Of Technology Manipur
Imphal – 795004
India

DEPARTMENT OF MECHANICAL ENGINEERING

M. Tech. SYLLABUS

SEMESTER I

Code	Subject	Lecture	Tutorial	Practical	Credit
MA519	Advanced Engineering Mathematics	3	0	0	6
ME507	Advanced Thermodynamics	3	0	0	6
ME509	Viscous Fluid Flows	3	0	0	6
ME511	Thermal-Fluids Experimentation	3	0	0	6
ME5XX	Elective -I	3	0	0	6
ME531	Thermal-Fluids Experimentation Laboratory	0	0	3	3
	Total	15	0	3	33

SEMESTER II

Code	Subject	Lecture	Tutorial	Practical	Credit
ME506	Convective Heat Transfer	3	0	0	6
ME508	Advanced I C Engines	3	0	0	6
ME5XX	Elective -II	3	0	0	6
ME5XX	Elective -III	3	0	0	6
ME532	Computational Laboratory	0	0	3	3
ME544	Seminar	0	0	2	2
	Total	12	0	5	29

SEMESTER III

Code	Subject	Lecture	Tutorial	Practical	Credit
ME621	Dissertation Preliminaries	0	0	24	24
	Total	0	0	24	24

SEMESTER VI

Code	Subject	Lecture	Tutorial	Practical	Credit
ME622	Dissertation	0	0	24	24
	Total	0	0	24	24

Total Number of Credit: 110

LIST OF DEPARTMENTAL ELECTIVES - I

Code	Subject	Lecture	Tutorial	Practical	Credit
ME551	Finite Element Method	3	0	0	6
ME553	Energy Conservation and Waste Heat Recovery	3	0	0	6
ME555	Refrigeration and Air-conditioning Technologies	3	0	0	6
ME557	Solar Thermal Engineering	3	0	0	6
ME559	Heat Transfer in Material Processing	3	0	0	6
ME561	Alternate Fuels	3	0	0	6

LIST OF DEPARTMENTAL ELECTIVES - II&III

Code	Subject	Lecture	Tutorial	Practical	Credit
ME552	Power Plant Engineering	3	0	0	6
ME554	Combustion Engineering	3	0-	0	6
ME556	Optimization Methods in Engineering	3	0	0	6
ME558	Renewable Energy	3	0	0	6
ME560	Cryogenics	3	0	0	6
ME562	Computational Fluid Dynamics	3	0	0	6
ME564	Environmental Pollution and Control	3	0	0	6
ME566	Advanced Turbomachines	3	0	0	6
ME568	Steam and Gas Turbines	3	0	0	6
ME570	Design of Heat Exchange Equipment	3	0	0	6
ME572	Advanced Thermal Storage Technologies	3	0	0	6
ME574	Heat Transfer Applications	3	0	0	6
ME576	Two Phase Flow Heat Transfer	3	0	0	6
ME578	Fire Dynamics and Engineering	3	0	0	6

COURSE CODE
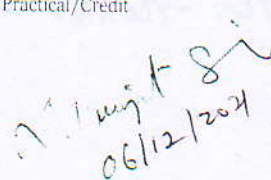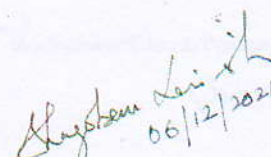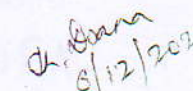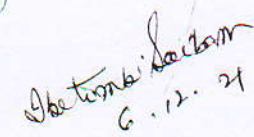## Dept. of Physics, NIT Manipur

06 Dec. 2021

Agenda: Correction of minor error in the subject codes of previously senate approved version of the subject code.

Remark: The distribution of three (3) elective subjects in the 4th semester was not clear. It has been rectified as follows: Any three electives subjects to be selected from the given list.

(1)MSc. Physics

SEMESTER	SUBJECT CODE	SUBJECT NAME	L	T	P	C	TOTAL
1st	PH501	Mathematical Physics-I	3	1	0	8	
	PH503	Classical Mechanics	3	1	0	8	
	PH505	Quantum Mechanics-I	3	1	0	8	44
	PH507	Electrodynamics- I	3	1	0	8	
	PH509	Computer Programming	2	0	2	6	
	PH531	Physics Laboratory – I	0	0	6	6	
2nd	PH502	Mathematical Physics – II	3	1	0	8	
	PH504	Electronics	3	1	0	8	
	PH506	Quantum Mechanics – II	3	1	0	8	44
	PH508	Electrodynamics – II	3	1	0	8	
	PH510	Numerical Methods & Computational Physics	2	0	2	6	
	PH532	Physics Laboratory – II	0	0	6	6	
3rd	PH601	Atomic & Molecular Physics	3	1	0	8	
	PH603	Condensed Matter Physics	3	1	0	8	
	PH605	Nuclear & Particle Physics	3	1	0	8	42
	PH607	Statistical Mechanics	3	1	0	8	
	PH631	Physics Laboratory – III	0	0	6	6	
	PH621	Project – I	0	0	4	4	
4th	PH602	Instrumentation	2	0	3	7	
	PH622	Project – II	0	0	12	12	
	PH6xx	Elective – 1*	3	1	0	8	43
	PH6xx	Elective - 2*	3	1	0	8	
	PH6xx	Elective – 3*	3	1	0	8	
* Elective courses to be selected from the list below.					Total credit:		173

		ELECTIVE COURSES					
PH6XX	PH650	Physics of Material synthesis & Characterization	3	1	0	8	
	PH652	Phase Transition & Critical Phenomena	3	1	0	8	
	PH654	Soft Condensed Matter Physics	3	1	0	8	
	PH656	Magnetism & Superconductivity	3	1	0	8	
	PH658	Crystal Physics & Symmetry	3	1	0	8	
	PH660	Laser Physics	3	1	0	8	
	PH662	Laser Spectroscopy	3	1	0	8	
	PH664	Fiber Optics	3	1	0	8	
	PH666	Optoelectronics Material & Devices	3	1	0	8	
	PH668	High Energy Physics	3	1	0	8	
	PH670	Quantum Information Theory	3	1	0	8	
	PH672	General Theory of Relativity	3	1	0	8	

L/T/P/C: Lecture/Tutorial/Practical/Credit

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Email:- nitmn@nitmanipur.ac.in , Website:- www.nitmanipur.ac.in
An Autonomous Institute under MHRD, Govt. of India.

Minutes of DPPC Meeting

Agenda: Discussions regarding the revision of course codes *Department Chemistry.*

Venue and Time: Office of HoD, 10th Nov, 2021 at 2:30 PM

Members Present:

(1) Dr. Chandi C. Malakar (HOD, Chairman, Assistant Professor, Chemistry)

(2) Dr. Th. David Singh (Member, Associate Professor, Chemistry)

(3) Dr. Mithun Roy (Member, Assistant Professor, Chemistry)

(4) Dr. Nagarajan S (Member, Assistant Professor)

(5) Dr. S. Lenin Singh (Member, Assistant Professor, Physics)

(6) Dr. Sunil Panday (Member, Assistant Professor, Mathematics)

Resolution:

A meeting has been conducted at 2:30 PM on 11th Nov. 2021 in the presence of members of the DPPC Department of Chemistry related to the revision of course codes. According to the suggestions and guidelines from the academic section the required modifications were performed which are shown below:

FIRST YEAR

Semester-1						Semester-2					
Course No	Course Name	L	T	P	C	Course No	Course Name	L	T	P	C
CH501	Transition and Non-transition Metal Chemistry	3	1	0	8	CH502	Inorganic Reaction Mechanism and Organometallics	3	1	0	8
CH531	Physical Chemistry Laboratory	0	0	9	9	CH504	Organic Reactions Mechanisms	3	1	0	8
CH503	Principles of Organic Chemistry	3	1	0	8	CH532	Organic Chemistry Laboratory	0	0	9	9
CH505	Quantum Chemistry	3	1	0	8	CH506	Chemical Dynamics and Electrochemistry	3	1	0	8
CH507	Group Theory and Spectroscopy	3	1	0	8	CH508	Applications of Spectroscopy	3	1	0	8
	Total Credits	12	4	9	41		Total Credits :	12	4	9	41

राष्ट्रीय प्रौद्योगिकी संस्थान, मणिपुर

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SECOND YEAR

Semester-3						Semester-4					
Course No	Course Name	L	T	P	C	Course No	Course Name	L	T	P	C
CH641	Graduate Seminar	0	0	2	2	CH602	Computer in Chemistry	2	0	1	5
CH601	Principles of Bioinorganic Chemistry	3	1	0	8	CH622	Project	0	0	18	18
CH603	Concepts in Organic Synthesis	3	1	0	8	CH6XX	Elective I	3	1	0	8
CH605	Modern Techniques and Scope of Chemical Biology	3	1	0	8	CH6XX	Elective II	3	1	0	8
CH607	Classical and Statistical Thermodynamics	3	1	0	8						
CH631	Inorganic Chemistry Laboratory	0	0	9	9						
	Total Credits :	12	4	11	43		Total Credits	8	2	19	39

Total credit for MSc (Che) 164

List of Elective Courses :

CH 652	:	Bioinorganic Chemistry
CH 654	:	Synthesis and Characterization of Inorganic Compounds
CH 656	:	Inorganic Photochemistry
CH 658	:	Chemistry of Coordination Compounds
CH 662	:	Advanced Organometallic Chemistry
CH 664	:	Introduction to Biomolecules
CH 666	:	Advances in Nucleic Acid and Lipid Chemistry
CH 668	:	Natural Product
CH 672	:	Principle and Applications of Luminescence Spectroscopy
CH 674	:	Advanced Quantum Chemistry
CH 676	:	Solid State Chemistry and its Applications
CH 678	:	Computational Chemistry

The PhD courses which are approved by 23rd Senate consists of same code patterns as suggested by academic section and the codes remain same. The list of courses are given below for ready reference please.

Course No	Course Name	L	T	P	C
CH701	Basic Inorganic Chemistry	3	1	0	8
CH702	Organometallics	3	1	0	8
CH703	Art in Organic Synthesis	3	1	0	8
CH704	New Reagents for Organic Synthesis	3	1	0	8
CH705	Physical Methods of Structure Elucidation	3	1	0	8
CH706	Analytical Principles and Instrumental Methods of Analysis	3	1	0	8
CH707	Chemical Applications of Group Theory	3	1	0	8

Al Include Agenda Item for 23rd Senate.

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11-11-21

DEPARTMENT OF MATHEMATICS
NIT MANIPUR

A. **Master of Science in Mathematics and Computing**

COURSE STRUCTURE

Semester I	L T P C
1. MA501 Analysis I	3 1 0 8
2. MA503 Ordinary Differential Equations	3 1 0 8
3. MA505 Complex Analysis	3 1 0 8
4. MA507 Discrete Mathematics	3 1 0 8
5. MA509 Computer Programming	3 0 2 8
Total 40

Semester II	L T P C
1. MA502 Analysis II	3 1 0 8
2. MA504 Partial Differential Equations	3 1 0 8
3. MA510 Data Structures and Algorithms	3 0 2 8
4. MA506 Linear Algebra	3 1 0 8
5. MA508 Topology	3 1 0 8
Total 40

Semester III	L T P C
1. MA601 Modern Algebra	3 1 0 8
2. MA603 Functional Analysis	3 1 0 8
3. MA605 Theory of Computation	3 1 0 8
4. MA607 Numerical Analysis	3 0 2 8
5. Elective I	3 0 0 6
6. MA621 Project-I	0 0 3 3
Total 41

Semester IV	L T P C
1. MA602 Probability and Statistics	3 1 0 8
2. MA604 Optimization Techniques	3 1 0 8
3. Elective II	3 0 0 6
4. Elective III	3 0 0 6
5. MA622 Project-II	0 0 12 12
Total 40

B. **List of Electives in M.Sc. Courses:**
   Elective I

1. MA651 Fluid Dynamics | [3 0 0 6]
2. MA653 Wavelets and Applications | [3 0 0 6]
3. MA655 Parallel Computing | [3 0 0 6]
4. MA657 Differential Geometry of Manifolds | [3 0 0 6]

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Elective II

1. MA652 Cryptography [3 0 0 6]
2. MA654 Number Theory and Cryptography [3 0 0 6]
3. MA656 General Relativity and Cosmology [3 0 0 6]
4. MA658 Integral Equations [3 0 0 6]

Elective III

5. MA660 Mathematical Methods [3 0 0 6]
6. MA662 Graph Theory [3 0 0 6]
7. MA664 Operator Theory in Hilbert Spaces [3 0 0 6]
8. MA666 Mathematical Modelling and Numerical Simulation [3 0 0 6]

C. List of Pre- PhD course work subjects:

1. MA701 Introduction to Analytic Number Theory and Algebraic Number Fields [3 0 0 6]
2. MA702 Number Theory [3 0 0 6]
3. MA703 Linear Algebra and Functional Analysis [3 0 0 6]
4. MA704 Real and Complex Analysis [3 0 0 6]
5. MA705 Measure Theory [3 0 0 6]
6. MA706 Differential Equations and Boundary-Value Problems [3 0 0 6]
7. MA707 Theory of Partial Differential Equations [3 0 0 6]
8. MA708 Advanced Real Analysis [3 0 0 6]
9. MA709 Fixed Point Theory [3 0 0 6]
10. MA710 Relativistic Cosmology [3 0 0 6]

D. List of Subjects in B. Tech. Courses

1. MA101 Engineering Mathematics-I [3 0 0 6]
2. MA102 Engineering Mathematics-II [3 0 0 6]
3. MA201 Mathematics-III [3 0 0 6]
4. MA202 Probability & Random Processes [3 0 0 6]
5. MA204 Numerical Methods [3 0 0 6]
6. MA301 Optimization [3 0 0 6]
7. MA303 Numerical Technique [3 0 0 6]
8. MA331 Numerical Methods Laboratory [0 0 3 3]

E. List of Subjects in M. Tech. Courses

1. MA519 Advanced Engineering Mathematics [3 0 0 6]

National Institute of Technology Manipur

Syllabus for BTech(Dept of HSS)

Course no	Course Name	L	T	P	C	Semester
HS201	Engineering Economics& Accountancy	2	0	0	4	3rd
HS302	MME	2	0	0	4	6th
HS401	Industrial Management	2	0	0	4	7th
HS403	Industrial Economics	2	0	0	4	7th
HS402	Management Principles& concepts	3	0	0	6	8th
HS404	Professional Ethics	3	0	0	6	8th

Department of Humanities & Social Sciences

Ph D syllabus

Course no	Course name	L	T	P	C	Semester
HS701	Research Methodology	3	0	0	6	1st
HS702	Commonwealth literature & African	3	0	0	6	1st
HS703	Literary theory	3	0	0	6	1st
HS741	Seminar course	2	0	0	4	2nd

Mamata Maisnam
10/11/2021
(DPPC Secretary).

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for 23rd Senate

Dr. Sangeeta Laishram
10/11/2021.

HoD (DPPC Chairman)
Dept. of HSS

10-11-21

CE 566	Principles of Photogrammetry	3-0-0-6
CE 568	Hydrometry and Instrumentation	3-0-0-6
CE 570	Hydro Informatics (AI, ANN, ANFIS, etc.)	3-0-0-6
CE 572	River and Lake Conservation	3-0-0-6
CE 574	Flood Modelling and Forecasting	3-0-0-6
CE 576	Biological Process in Environmental Engineering	3-0-0-6
CE 578	**Advanced Hydraulic Engineering**	3-0-2-8
CE 580	**River Dynamics & Engineering**	3-0-2-8
CE 582	Hydro-Meteorology* (External Expert Reqd.)	3-0-0-6
CE 584	Hydrological and Hydraulic Modelling	3-1-0-8
CE 586	Advanced Fluid Mechanics	3-0-2-8
CE 588	Fluvial Hydraulics	3-0-0-6
CE 590	EcoHydraulics & EcoHydrology	3-0-0-6
CE 592	Geospatial Hydrology & Climate Change	3-0-2-8
CE 594	Geoinformatics for Disaster Management (GeoDM)	3-0-0-6
CE 596	Geomatics in Urban Analysis	3-0-0-6
CE 598	**Thermal, Microwave & Hyperspectral Remote Sensing**	3-0-2-8
CE 550	Groundwater Engineering	3-0-0-6

Ph.D. Syllabus

Course Work

Course Code	Course Name	L-T-P-C
CE 701	Structural Dynamics	3-0-0-6
CE 702	Earthquake Resistant Design of Buildings	3-0-0-6

Seminar Courses (PhD)

Course Code	Course Name	L-T-P-C
CE 741	Finite Element Methods for Static and Dynamic Problems	2-0-0-4
CE 742	Optimization Methods in Engineering	2-0-0-4
CE 743	Applications of Mathematical GIS	2-0-0-4
CE 744	Structural Health Monitoring	2-0-0-4
CE 745	Application of Remote Sensing and GIS in Groundwater Modelling	2-0-0-4
CE 746	Introduction to Computational Fluid Dynamics	2-0-0-4

Dr. Ngangbam Romeji
Head of Dept
Department of Civil Engineering

Department of Electronics & Communication Engineering
राष्ट्रीय प्रौद्योगिकी संस्थान,मणिपुर

Langol, Imphal – 795 004, Ph. (0385)2445812, e-mail: hodece@nitmanipur.ac.in
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PhD (Electronics & Communication Engineering)

Course Code	Course Title	L	T	P	C
EC 701	Smart Antenna	3	0	0	6
EC 703	Wireless & Mobile Communication	3	0	0	6
EC702	Antenna and FSS Design	3	0	0	6
EC705	Hardware Software Codesign	3	0	0	6
EC707	Digital TV Engineering	3	0	0	6
EC704	Radar Engineering	3	0	0	6
EC706	Linear Algebra and Optimization	3	0	0	6
EC708	Machine Intelligence	3	0	0	6

SYLLABI

for

Ph.D.

in

Mechanical Engineering

PhD.(Manuf. + Design)

DEPARTMENT OF

MECHANICAL ENGINEERING

National Institute Of Technology Manipur
Imphal - 795001
India

PhD.(Manuf. + Design)

DEPARTMENT OF MECHANICAL ENGINEERING

Ph.D. Syllabus

Code	Subject	Lecture	Tutorial	Practical	Credit
ME701	Advances in Foundry Technology	3	0	0	6
ME702	Characterization Techniques	3	0	0	6
ME703	Failure Analysis	3	0	0	6
ME704	Principles of Material Selection	3	0	0	6
ME705	Principles of Solidification	3	0	0	6
ME706	Mechanics of Composite Materials	3	0	0	6
ME707	Advanced Mechanics of Solids	3	0	0	6
ME708	Advanced Mechatronics	3	0	0	6

(2) B. Tech. Physics

SEMESTER	SUBJECT CODE	SUBJECT NAME	CREDIT				
			L	T	P	C	TOTAL
1st	PH101	Engineering Physics	3	0	0	6	
	PH131	Engineering Physics Lab	0	0	6	6	

(3) PhD Physics

SEMESTER	SUBJECT CODE	SUBJECT NAME	CREDIT				
			L	T	P	C	TOTAL
Pre-PhD course work	PH701	Advance Quantum Mechanics	3	0	0	6	
	PH702	Advanced Classical Mechanics	3	0	0	6	
	PH703	Advanced Statistical Mechanics	3	0	0	6	
	PH704	Advanced Electrodynamics	3	0	0	6	
	PH705	Advanced Condensed Matter Physics	3	0	0	6	
	PH706	Nanoscience & Applications	3	0	0	6	

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L/T/P/C: Lecture/Tutorial/Practical/Credit

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SECOND YEAR

Semester-3						Semester-4				
Course No	Course Name	L	T	P	C	Course No	Course Name	L	T	P	C
CH641	Graduate Seminar	0	0	2	2	CH602	Computer in Chemistry	2	0	4	5
CH601	Principles of Bioinorganic Chemistry	3	1	0	8	CH622	Project	0	0	18	18
CH603	Concepts in Organic Synthesis	3	1	0	8	CH6XX	Elective I	3	1	0	8
CH605	Modern Techniques and Scope of Chemical Biology	3	1	0	8	CH6XX	Elective II	3	1	0	8
CH607	Classical and Statistical Thermodynamics	3	1	0	8						
CH631	Inorganic Chemistry Laboratory	0	0	0	0						
	Total Credits :	12	4	11	43		Total Credits :	8	2	19	39

Total credit for MSc (Che) 164

List of Elective Courses :

CH 652	:	Biomorganic Chemistry
CH 654	:	Synthesis and Characterization of Inorganic Compounds
CH 656	:	Inorganic Photochemistry
CH 658	:	Chemistry of Coordination Compounds
CH 662	:	Advanced Organometallic Chemistry
CH 664	:	Introduction to Biomolecules
CH 666	:	Advances in Nucleic Acid and Lipid Chemistry
CH 668	:	Natural Product
CH 672	:	Principle and Applications of Luminescence Spectroscopy
CH 674	:	Advanced Quantum Chemistry
CH 676	:	Solid State Chemistry and its Applications
CH 678	:	Computational Chemistry

The PhD courses which are approved by 23rd Senate consists of same code patterns as suggested by academic section and the codes remain same. The list of courses are given below for ready reference please.

Course No.	Course Name	L	T	P	C
CH701	Basic Inorganic Chemistry	3	1	0	8
CH702	Organometallics	3	1	0	8
CH703	Art in Organic Synthesis	3	1	0	8
CH704	New Reagents for Organic Synthesis	3	1	0	8
CH705	Physical Methods of Structure Elucidation	3	1	0	8
CH706	Analytical Principles and Instrumental Methods of Analysis	3	1	0	8
CH707	Chemical Applications of Group Theory	3	1	0	8

Al Molecule Agenda Item for 23rd Senate.

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11-11-21

Elective II

1.	MA652 Cryptography	[3 0 0 6]
2.	MA654 Number Theory and Cryptography	[3 0 0 6]
3.	MA656 General Relativity and Cosmology	[3 0 0 6]
4.	MA658 Integral Equations	[3 0 0 6]

Elective III

5.	MA660 Mathematical Methods	[3 0 0 6]
6.	MA662 Graph Theory	[3 0 0 6]
7.	MA664 Operator Theory in Hilbert Spaces	[3 0 0 6]
8.	MA666 Mathematical Modelling and Numerical Simulation	[3 0 0 6]

C. List of Pre- PhD course work subjects:

1.	MA701 Introduction to Analytic Number Theory and Algebraic Number Fields	[3 0 0 6]
2.	MA702 Number Theory	[3 0 0 6]
3.	MA703 Linear Algebra and Functional Analysis	[3 0 0 6]
4.	MA704 Real and Complex Analysis	[3 0 0 6]
5.	MA705 Measure Theory	[3 0 0 6]
6.	MA706 Differential Equations and Boundary-Value Problems	[3 0 0 6]
7.	MA707 Theory of Partial Differential Equations	[3 0 0 6]
8.	MA708 Advanced Real Analysis	[3 0 0 6]
9.	MA709 Fixed Point Theory	[3 0 0 6]
10.	MA710 Relativistic Cosmology	[3 0 0 6]

D. List of Subjects in B. Tech. Courses

1.	MA101 Mathematics-I	[3 0 0 6]
2.	MA102 Mathematics-II	[3 0 0 6]
3.	MA201 Mathematics-III	[3 0 0 6]
4.	MA202 Probability & random Processes	[3 0 0 6]
5.	MA204 Numerical Methods	[3 0 0 6]
6.	MA301 Optimization	[3 0 0 6]

National Institute of Technology Manipur

Syllabus for BTech(Dept of HSS)

Course no	Course Name	L	T	P	C	Semester
HS201	Engineering Economics& Accountancy	2	0	0	4	3rd
HS302	MME	2	0	0	4	6th
HS401	Industrial Management	2	0	0	4	7th
HS403	Industrial Economics	2	0	0	4	7th
HS402	Management Principles& concepts	3	0	0	6	8th
HS404	Professional Ethics	3	0	0	6	8th

Department of Humanities & Social Sciences

Ph D syllabus

Course no	Course name	L	T	P	C	Semester
HS701	Research Methodology	3	0	0	6	1st
HS702	Commonwealth literature & African	3	0	0	6	1st
HS703	Literary theory	3	0	0	6	1st
HS741	Seminar course	2	0	0	4	2nd

Mamata Maisnam
·10/11/2021
(DPPC Secretary)·

AR(Acad)

for 23rd Senate

Dr. Sangeeta Laishram
10/11/2021·

HOD (DPPC Chairman
Dept. of HSS

Sr No	CODE STRUCTURE: XX-Y-LM-N		
		CE, ME, EE, EC, CS, MA, CH, PH, HS	
1	XX	Y=1	
2	B. Tech 1st Year	Y=2	
3	B. Tech 2nd Year	Y=3	
4	B. Tech 3rd Year	Y=4	
5	B. Tech 4th Year	Y=5	
6	M.Sc. 1st Year	Y=6	
7	M.Sc. 2nd Year	Y=5	
8	M. Tech. 1st Year	Y=6	
9	M. Tech 2nd Year	Y=7	
10	Ph.D.	LM=00-04 First Start with LM=00	
11	B. Tech./M.Sc./M.Tech./Ph.D. Theory courses	LM=05-09 First Start with LM=05	
12	Seminar course subjects	LM=10-29 First Start with LM=10	
13	Lab courses	LM=30-59 First Start with LM=30	
14	**Department Elective** Theory to respective departments	LM=60-89 First Start with LM=60	
15	**Open Elective** theory offered by the Department	LM=90-92	
16	Projects	N=1, 3, 5, 7, 9 First Start with N=1	
17	B. Tech./M.Sc./M. Tech. **Odd Semester** Theory/Lab/Seminar/project/elective Courses		
18	B. Tech./ M.Sc./M. Tech. **Even Semester** Theory/Lab/Seminar/project/elective Courses	N= 0, 2, 4, 6, 8 First Start with N=2	N=0 if LM≠ (00 or 05 or 10 or 30 or 60 or 90)
19	Ph.D.	N=0, 1,2,3,4,5,6,7,8,9 First Start with N=1	N=0 if LM≠ (00 or 05 or 10 or 30 or 60 or 90)

Departments are also requested to prepare the following list of electives for B. Tech., M. Tech. and M.Sc. courses.

1. Department Elective-I
2. Department Elective-II
3. Department Elective-III
4. Department Elective-IV
5. Department Elective-V
6. Open Elective