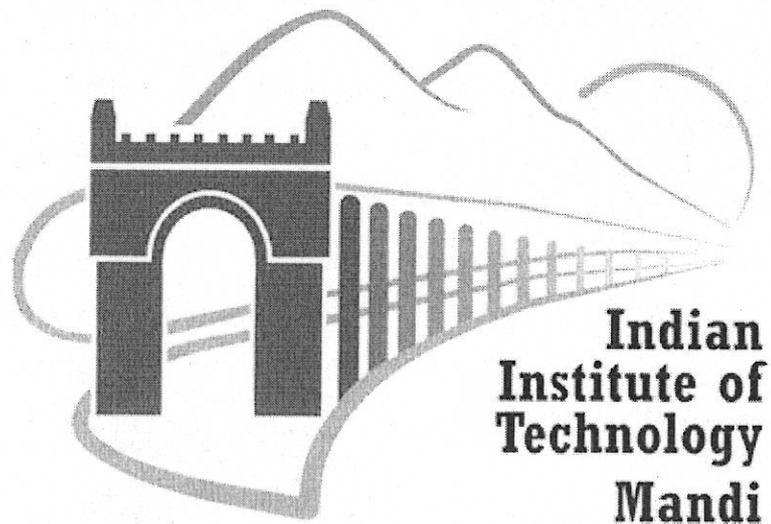


INDIAN INSTITUTE OF TECHNOLOGY MANDI
KAMAND, DISTT. MANDI – 175005 (HIMACHAL PRADESH)



MINUTES OF 18TH BOARD OF ACADEMICS MEETING

VENUE : NKN CONFERENCE ROOM, KAMAND)
DATE : 15TH SEPTEMBER, 2017 (FRIDAY)
TIME : 4:00 P.M.

Following members attended the meeting

Sl.No.		Name	
1.	Dean Academics	Prof. B.D. Chaudhary	Chairman
2.	Associated Dean (Research)	Dr. Venkata Krishnan	Member
3.	Chairman Library Advisory Committee	Dr. Astrid Kiehn	Member
4.	Chairman Course Proposal Committee	Dr. Chayan K Nandi	Member
5.	Course Coordinator (IC Courses)	Dr. Bharat S Rajpurohit	Member
6.	Course Coordinator (B.Tech.- CSE)	Dr. Dileep A.D.	Member
7.	Course Coordinator (B.Tech.- EE)	Dr. SubashishDatta	Member
8.	Course Coordinator (B.Tech.- ME)	Dr. Arpan Gupta	Member
9.	Course Coordinator (B.Tech.- Civil)	Dr. KaustavSarkar	Member
10.	Course Coordinator (M.Tech. (Energy Materials/Mechanical Engg. (Energy Systems))	Dr. AtulDhar	Member
11.	Course Coordinator (M.Tech in EE-VLSI)	Dr. Hitesh Shrimali	Member
12.	Course Coordinator (M.Tech. (Communication & Signal Processing))	Dr. Renu M Rameshan	Member
13.	Course Coordinator (M.Tech. (Power Electronics and Drives))	Dr. Narsa Reddy Tummuru	Member
14.	Course Coordinator (M.Tech-BioTech)	Dr. Shyam K Masakpalli	Member
15.	Course Coordinator (M.Sc. (Chemistry))	Dr. AniruddhaChakraborty	Member
16.	Course Coordinator (M.Sc.-Applied Maths)	Dr. Rajendra Ray	Member
17.	Course Coordinator (M.Sc. (Physics))	Dr. ChanderShekharYadav	Member
18.	Nominee-1: School of Engineering	Dr. Rajesh Ghosh	Member
19.	Nominee-2: School of Engineering	Dr. VenkataUdayKala	Member
20.	Nominee-1: School of Computing & Electrical Engineering	Dr. KunalGhosh	Member
21.	Nominee-2: School of Computing & Electrical Engineering	Dr. Aditya Nigam	Member
22.	Nominee-1: School of Basic Sciences	Dr. Syed Abbas	Member
23.	Nominee-2: School of Basic Sciences	Dr. ProsenjitMondal	Member
24.	Nominee-2: School of Humanities & Social Sciences	Dr. ShyamasreeDasgupta	Member
25.	Academic Affairs Secretary : Student Member	Mr. J. Raghunath	Member
26.	Research Affairs Secretary: Student Member	Ms. Manushree	Member
27.	Assistant Registrar (Academics)	Mr. Suresh Rohilla	Secretary

Following members could not attend the meeting

1.	Associated Dean (Courses)	Dr. PradeepParameswaran	Member
2.	Course Coordinator (SHSS courses)	Dr. Rahul Vaish	Member
3.	Course Coordinator (I-Ph.D.)	Dr. HariVarma	Member
4.	Nominee-1: School of Humanities & Social Sciences	Dr. Ashok Kumar	Member
5.	Industry Member - I	Dr. NadeemAkhtar	Member

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Special Invitee

1.	Dr. Shubhajit Roy Chowdhury	Asst. Prof., SCEE
2.	Dr. Prasanth P Jose	Asst. Prof., SBS
3.	Dr. RajeshwariDutt	Asst. Prof., SHSS
4.	Dr. Rajeev Kumar	Asso. Prof., SE
5.	Dr. Sandip Kumar Saha	Asst. Prof., SE
6.	Dr. Ankush Bag	Asst. Prof., SCEE
7.	Dr. GopiShrikanth Reddy	Asst. Prof., SCEE
8.	Dr. Rahul Shrestha	Asst. Prof., SCEE

PART-A

(Issues discussed by the Board of Academics when the Student Members were present)

18.1 Confirmation of Part-A minutes of the 17th meeting of Board of Academics:

Minutes of the 17th meeting of Board of Academics (BoA) held on 25th May, 2017 were confirmed.

18.2 Action Taken Report

The Board of Academics noted the actions taken on implementation of the decisions taken in the 17th Board of Academics meeting.

18.3 To consider award of Ph.D., M.S. (by Research), M.Tech., M.Sc. (Chemistry), and B.Tech degree on the registered students who have completed all the requirements of the degree:

The Board recommended the following lists of the students (16 Ph.D., 05 M.S. (by Research), 03 M.Tech., 18 M.Sc. (Chemistry) and 116 B.Tech. (including 114 from 2013, 01 from 2012 and 01 from 2011 batch), who have completed all the requirements for the above degrees to the Senate for award of the degree during 5th Convocation scheduled to be held on 7th October, 2017.



a) Doctor of Philosophy (Ph.D.)

Sl. No	Name & Roll No.	Date of Joining/ Date of Completion	Guide	Thesis Title	Viva- Voce Board	Thesis Examiners
1	Navneet Singh (D10003)	DoJ: 20.10.2010 DoC: 08.03.2017 (6 Years, 5 months)	Dr. Bindu Radhamany	Electronic and Structural Studies of Transition Metal Oxides	Dr. Hari varma (Chairman) Prof. Priya Mahadevan (S.N Bose NCBS Kolkata) Dr. Bindu Radhamany (Guide) Prof. Lalit Malhotra (Specialist) Dr. Suman K Dr. Prem Felix Siril	Prof. Priya Mahadevan (S.N. Boss NCBS Kolkata) Prof. Fujimori Atsushi
2	Pushpendra Kumar (D10004)	DoJ:19.10.2010 DoC: 13.01.2017 (6 Years, 3 months)	Dr. Suman K Pal	Energy and Electron Transfer as Probe of the Interfacial Interaction between Quantum Dot and Organic Molecule	Dr. Suman Kalayan Pal (Guide) Dr. Pradyumna Kumar (Chairman) Dr. Chayan K. Nandi Dr. Bindu Radhamany Dr. Vishal Singh Chauhan Dr. Anil K Sao	Prof. K George Thomas (IISER Thiruvanthapuram) Prof. Ken Ghiggino (Australia)
3	Hemant Jalota (D10007)	DoJ:19.10.2010 DoC: 03.02.2017 (6 Years, 4 months)	Dr. Manoj Thakur	Soft Computing Approaches For Portfolio Optimization: An Empirical Study	Dr. Prasanth P Jose (Chairman) Dr. V. Mani (IISc Bangalore) Dr. Manoj Thakur (Guide) Dr. Aparna Mehra (Specialist) Dr. Sarita Azad Dr. Syed Abbas Dr. Rajeev Kumar	Prof. Patrick Siarry (Paris France) Dr. V Mani (IISc Bangalore)
4	Abhishek Gupta (D11018)	DoJ: 01.08.2011 DoC: 14.02.2017 (5 Years, 6 months)	Dr. Chayan Kanti Nandi	Doped and Functionalization Carbon Dots for Ultrasensitive and Highly Selective Toxic Metal Ions, Biothiols and Neurotransmitter Recognition	Dr. Prasanth P Jose (Chairman) Dr. Prasanta K Das (IACS Kolkata) Dr. Chauhan Kanti Nandi (Guide) Dr. Ajay Soni (Specialist) Dr. Abhimanew Dhir Dr. Satinder K Sharma Dr. Venkata Krishnan Dr. Tulika P. Srivastava	Prof. Prasanta K Das (IACS Kolkata) Prof. Magdalena Titirici (Queen Marry University of London)
5	Raj Kumar (D11019)	DoJ: 31.07.2011 DoC: 16.03.2017 (5 Years, 8 months)	Dr. Prem Felix Siril	A Novel Evaporation Assisted Solvent Antisolvent Interaction Method for the Nanocrystalization of Organic Compounds	Dr. Prasanth P. Jose (Chairman) Prof. Anil Kumar Singh (IIT Bombay) Dr. Prem Felix Siril (Guide) Dr. Pramod Soni (Specialist) Dr. Subrata Ghosh Dr. Pradeep P Dr. Rahul Vaish	Prof. Rajesh N. Dave (New Jersey Institute of Technology USA) Prof. Anil K Singh (IIT Bombay)

6	Sunil Kumar (D11020)	DoJ: 31.07.2011 DoC: 01.03.2017 (5 Years, 8 months)	Dr. Subrata Ghosh	Understanding the structure- Optical Property Relationship in New Organic materials: Design, Synthesis and OLED Applications	Dr. Prasanth P Jose (Chairman) Prof. Mahesh Hariharan (IISER Trivendrum) Dr. Subrata Ghosh (Guide) Dr. Prabal Banerjee (Specialist) Dr. Vankata Krishnan Dr. Pradeep C. Prameshwaran	Prof. J.A. Gareth Williams (Durham University United Kingdom) Dr. Mahesh Hariharan (IISER Trivendrum)
7	Manisha Devi (D11021)	DoJ: 31.07.2011 DoC: 22.03.2017 (5 Years, 8 months)	Dr. Pradeep Parameswaran	Development of New Fluorescent Chemosensors for various Analytes and Their Evaluation as Molecular Logic Gates	Dr. Prasanth P Jose (Chairman) Dr. Santanu Kumar Pal (IISER Mohali) Dr. Paradeep Parameswaran (Guide) Dr. Rajendra Srivastva (IIT Ropar) Dr. Anirudha Chakarborty Dr. Rajeev Kumar Dr. Syed Abbas	Dr. Santanu Pal (IISER Mohali) Prof. Cheal Kim (Seoul national University of Science and Technology, Republic Korea)
8	Lakshmanan S A (D11037)	DoJ: 17.08.2011 DoC: 07.08.2017 (6 Years)	Dr. Bharat Singh Rajpurohit Dr. Amit jain (Co-Guide)	Design and Performance Analysis of Grid Connected Solar PV System	Dr. Anil K. Sao (Chairman) Prof. Mahesh Kumar Mishra (IIT Chennai) Dr. Bharat Singh Rajpurohit (Guide) Dr. Amit jain (Co-Guide) Prof. Ramesh Oruganti (Specialist) Dr. Prem Felix Siril Dr. Arti Kashyap Dr. Samar Agnihotri	Prof. Mahesh Kumar Mishra (IIT Madras) Prof. Jeaho Choi (Republic of Korea)
9	Reena Sharma (D11039)	DoJ: 31.01.2012 DoC:12.07.2017 (5 Years, 6 months)	Dr. P.C. Ravikumar Dr. Aditi Halder (Co- guide)	Phytochemical Investigations of Roylea Cinerea and Its Applications	Dr. Prasanth P. Jose (Chairman) Dr. Dattareya Dethe (IIT Kanpur) Dr. P.C. Ravikumar (Guide) Dr. Aditi Halder (Co-guide) Dr. Sripada SV Ramasastry (Specialist) Dr. Abhimanew Dhir (DC Chair) Dr. Prem Felix Siril Dr. Pradeep C. Parameswaran Dr. Venkata Krishnan Dr. Rahul Vaish	Prof. Dr. Randolph Arroo (Leicester LE1, United Kingdom) Dr. Dattatrey H Dethe (IIT Kanpur)
10	Rajeev Kumar (D11043)	DoJ: 31.01.2012 DoC:12.07.2017 (5 Years, 6 months)	Dr. Bharat Singh Rajpurohit	Design and Performance Analysis of Multi- Terminal DC Microgrid	Dr. Anil K Sao (Chairman) Prof. S.P. Singh (Thesis Examiner)	Prof. S.P. Singh (IIT Roorkee)

					Dr. Bharat Singh (Guide) Prof. Ramesh Oruganti (Specialist/Expert) Dr. Samar Agnihotri Dr. Manoj Thakur Dr. Bhakti Madhav Joshi	Prof. Ross Baldick (Austin USA)
11	Darsi Rambabu (D12055)	DoJ: 25.06.2012 DoC: 12.07.2017 (5 Years, 1 month)	Dr. Abhimanew Dhir Dr. Pradeep Parmeswaran (Co-guide)	Metal Organic Materials (MOMs) for Environmental, Biological and Catalytic Applications	Dr. Prasanth P. Jose (Chairman) Dr. Abhimanew Dhir (Guide) Dr. V. Manivanan (IIT Guwahati) Dr. Kailasam Kamalakannan (Specialist) Dr. Chayan K. Nandi (DC Chair) Dr. Venkata Krishnan Dr. Prem Felix Siril Dr. Satinder Kumar Sharma Dr. Pardeep C. Parameswaran	Prof. V. Manivannan (IIT Guwahati) Prof. Nobuhiko Iki (Aboba-Ku, Japan)
12	Shilpa Sharma (D12057)	DoJ:13.06.2012 DoC: 22.08.2017 (5 Years, 2 months)	Dr. Pradeep Parameswaran Dr. Abhimanew Dhir (Co-Guide)	Synthesis and photo-Physical Properties of Carbazole and Benzimidazole Based Fluorescent Derivatives	Dr. Chayan K. Nandi (Chairman) Dr. Suman Kalyan Dr. Sudhir Kumar Pandey Dr. Pradeep C. Parameswaran Dr. Abhimanew Dhir	Dr. Muniappan Sankar (IIT Roorkee) Prof. Katsuhiko Ariga (NIMS Ibaraki Japan)
13	Swati Tyagi (D12072)	DoJ: 05.07.2012 DoC: 23.12.2016 (4 Years, 5 months)	Dr. Syed Abbas	Analysis of Neural Network models of Integer and Non- Integer Order	Dr. Manoj Thakur (Chairman) Dr. Jaydev Dabas (IIT Roorkee) Dr. Syed Abbas Prof. M. Saleem (AMU Aligarh, Specialist) Dr. Muslim malik Dr. Vishal S. Chauhan	Dr. Jaydev Dabas (IIT Roorkee) Prof. Loannis K. Argyros (Lawton USA)
14	Yashwant Kashyap (D12079)	DoJ: 31.07.2012 DoC: 22.08.2017 (6 Years, 1 month)	Dr. Anil K Sao	Solar Radiation Assessment and Forecasting over India in the Presence of Dust and Fog Activity	Dr. Rajeev Kumar (Chairman) Prof. Rangan Banerjee (IIT Bombay) Dr. Anil K Sao (Guide) Prof. S.S Chandel (Specialist) Dr. P. Anil Kishan Dr. Sarita Azad Dr. Rajeev Kumar	Prof. Elias (Lee) Stefanakos (University of South Florida) Dr. Rangan Banerjee (IIT Bombay)
15	Pankaj Gaur (D13006)	DoJ: 29.07.2013 DoC: 07.08.2017 (4 Years)	Dr. Subrata Ghosh	Structurally Engineered Biocompatible Molecular Probes For Live Cell-Imaging and Localization of Native DNA	Dr. Prasanth P. Jose (Chairman) Prof. P.K. Iyer (IIT Guwahati) Dr. Subrata Ghosh (Guide)	Prof. Parameswaran K. Iyer (IIT Guwahati) Prof. Yi Pang

					Dr. Joydev Laha Dr. Ajay Soni Dr. Prem Felix Siril Dr. Venkata Krishnan	(USA)
16	Srimanta Mandal (D13014)	DoJ:19.10.2010 DoC:13.07.2017 (6 Years, 9 months)	Dr. Anil K Sao	Novel Approaches For Super Resolution of Intensity/Range Image Using Sparse Representation	Dr. A.D. Dileep (Chairman) Prof. Subhasis Chaudhuri (IIT Bombay) Dr. Anil K Sao (Guide) Prof. Deepak Khemani (Specialist) Dr. Satinder Sharma Dr. Barat Singh Rajpurohit Dr. Rajeew Kumar Prof. B.D. Chaudhary	Prof. Subhasis Chaudhuri (IIT Bombay) Dr. Vijayan K. Asari (USA)

b) Master of Science (M.S. (by Research))

Sl. No	Name & Roll No.	Date of Joining/ Date of Completion	Guide	Thesis Title	Academic Progress Committee	External Examiners
1	Tulika Agarwal (S13001)	DoJ: 29.07.2013 DoC:09.05.2017 (3 years, 10 months)	Dr. Samar Agnihotri	Secure Analog Network Coding in the presence of a Single Eavesdropper	Dr. Bharat Singh Rajpurohit (Chairman) Dr. Samar Agnihotri (Guide) Dr. Muslim Malik Dr. Satyajit Thakor	Prof. Ketan Rajawat (IIT Kanpur) Prof. Brijesh Kumar Rai (IIT Guwahati)
2	Munender Kumar (S13002)	DoJ: 29.07.2013 DoC:13-04-2017 (3 Years, 9 months)	Dr. Renu M Rameshan	Independent Subspace Analysis for Activity Recognition and Fine-Grained Classification	Dr. Anil K. Sao (Chairman) Dr. Renu M (Guide) Dr. Arnab Bhavsar Dr. Padamanabhan Rajan Dr. Prasanth P Jose	Prof. Santanu Chaudhary Prof. Nikhil R. Pal (ECSU Kolkata)
3	Vishal Goel (S13003)	DoJ: 29.07.2013 DoC:03.05.2017 (3 years, 10 months)	Dr. B. D. Chaudhary Dr. Sriram Kailasam (co-guide)	A Stream-Based Scalable Algorithm For Formal Concept Analysis	Dr. Bharat Singh (Chairman) Dr. B.D Chaudhary (Guide) Dr. Sriram Kailasam Dr. A.D. Dileep	Prof. Sanjay Kumar Jain (NIT Haryana) Dr. Vikram Goyal
4	Kartik Gupta (S14002)	DoJ: 01.08.2014 DoC:07.02.2017 (2 Years, 6 months)	Dr. Arnab Bhavsar	Human Action Analysis: Novel Methods and Perspectives	Dr. Anil K. Sao (Chairman) Dr. Arnab Bhavsar (Guide) Dr. Samar Agnihotri Dr. C.S. Yadav	Prof. C.V. Jawahar (IIIT Hyderabad) Dr. Anurag Mittal (IIT Madras)
5	Shah Vishrut Sunil (S14007)	DoJ:13.08.2014 DoC: 17.01.2017 (2 Years, 5 months)	Dr. Mohammad Talha Dr. Rajeew Kumar (Co-Guide)	Numerical and Experimental Study of Bistable Piezoelectric Energy Harvester	Dr. Rajeew Kumar (Chairman) Dr. Mohammad Talha (Guide) Dr. Vishal Singh Chauhan Dr. Rahul Vaish Dr. Prasanth P. Jose	Prof. Anindya Chatterjee (IIT Kanpur) Prof. Ranjan Ganguli (IISc Bangalore)

c) **Master of Science in Chemistry (M.Sc. (Chemistry))**

Sl. No.	Roll No.	STUDENT NAME
1	V15001	Akshita Sharma
2	V15002	Parveen Kumar
3	V15003	Ganga Singh
4	V15004	Deepak Kumar
5	V15005	Sanjhal Jain
6	V15006	Navneet Matharoo
7	V15007	Shubham Biswas
8	V15008	Swadhapriya Bhukta
9	V15009	Tapas Adhikary
10	V15010	Anu Kumari
11	V15011	Kanika Bharti
12	V15012	Shivani Verma
13	V15013	Vicky Varma
14	V15014	Ankita Dhiman
15	V15015	Mohammad Ashraf
16	V15016	Priyanka Negi
17	V15017	Sudhanshu Sharma
18	V15018	Tushar Verma

d) **Master of Technology in Energy Engineering with specialization in Materials (M.Tech. (Energy Engineering))**

Sl. No.	Roll No.	STUDENT NAME
1	T15001	Sidhant Kumar
2	T15002	Vikrant
3	T15005	Rajgaurav

e) **B.Tech Honors Degree:**

Sl. No.	Roll No.	STUDENT NAME	Branch	Degree Awarded
1	B13103	ABHISHEK PANDEY	CSE	B.Tech Honors in Computer Science & Engineering
2	B13136	SAMRIDDHI JAIN	CSE	B.Tech Honors in Computer Science & Engineering
3	B13218	PAAWAN MUKKER	CSE	B.Tech Honors in Computer Science & Engineering
4	B13226	SANJEEV KHARE	EE	B.Tech Honors in Electrical Engineering

f) **Bachelor of Technology (B.Tech.) in Computer Science and Engineering**

50 students have completed all the requirements for the award of 'Bachelor of Technology' degree in Computer Science and Engineering. Their names and Roll. Nos. are as given below:

Sl. No.	Roll No.	Student Name	Degree Awarded with
1	B13101	ABHAY SINGH	--
2	B13102	ABHIMANYU MITTAL	<i>Minor in Management</i>
3	B13103	ABHISHEK PANDEY	--
4	B13104	AHMED ABDUL KAREEM KARANATH	--
5	B13105	AJAY KUMAR MEENA	--
6	B13106	AMAN GUPTA	--
7	B13107	AMIT KUMAR	--
8	B13108	ANKUR SARDAR	--
9	B13109	ANKUSH JINDAL	<i>Minor in Management</i>
10	B13110	ARPIT KRISHNA	--
11	B13111	AYUSH GARG	--
12	B13112	AYUSH KUMAR YADAV	--
13	B13113	BANDA BHARATHKUMAR	--
14	B13114	CHANDAN PURBIA	--
15	B13115	CHANDRA JEET NAGAR	--
16	B13116	DEEPANSHU SAPRA	--
17	B13117	DEEPANSHU GUPTA	--
18	B13118	DEPINDER PREET SINGH	<i>Minor in Management</i>
19	B13119	FARAH ANJUM	<i>Minor in Applied Physics</i>
20	B13120	GHANSHYAM YADAV	--
21	B13121	GOPAL KRISHAN AGGARWAL	<i>Minor in Management</i>
22	B13123	KANSUL MAHRIFA C ABDURAHIMAN	--
23	B13124	KARAVADI TOYAZ SAI MADHAV	--
24	B13125	KARRE NITIN	--
25	B13127	MAYANK KISHORE	--
26	B13129	NAMAN GUPTA	--
27	B13130	PRATEEK RAJDEV	--
28	B13131	PRIYANKA MAHAWAR	--
29	B13133	RITESH KUMAR	--
30	B13134	ROHIT BISHNOI	--
31	B13135	SAGAR GHAI	<i>Minor in Management</i>
32	B13136	SAMRIDDHI JAIN	--
33	B13137	SHIVANSH SAPRA	--
34	B13138	SHRUTI GARG	<i>Minor in Management</i>
35	B13139	TARANI HITESH MAHENDRA	--
36	B13140	VEMULA YAMINEE JYOTHSNA	--
37	B13141	VINOD KUMAR	--

38	B13204	ASHISH KUMAR BEDI	<i>Minor in Management</i>
39	B13218	PAAWAN MUKKER	--
40	B13225	SAMYA RANJAN PATRO	--
41	B13231	SHUBHAM CHANDEL	--
42	B13234	SWAPNIL SHARMA	--
43	B13235	TUSHAR GUPTA	--
44	B13305	ASWINKUMAR A	--
45	B13312	HIMANSHU SINGAL	--
46	B13318	MUKARRAM TAILOR	--
47	B13327	RISHABH NARANG	--
48	B13334	SPARSH SAURABH	--
49	B13339	VISHWAMANGAL	--
50	B11022	MOHIT KUMAR	--

g) **Bachelor of Technology (B.Tech.) in Electrical Engineering**

38 students have completed all the requirements for the award of 'Bachelor of Technology' degree in Electrical Engineering. Their names and Roll. Nos. are as given below:

Sl. No.	Roll No.	Student Name	Degree Awarded with
1	B13202	AKSHAT GUPTA	<i>Minor in Applied Physics</i>
2	B13203	ANKUR GANGWAL	--
3	B13205	AVANISH KUMAR YADAV	<i>Minor in Management</i>
4	B13206	AVNISH KUMAR	--
5	B13208	BANDARI MANOJ KUMAR	--
6	B13209	DEEPIKA CHAUDHRY	--
7	B13210	G D S V V S S SADWITH	--
8	B13211	GADIPALLI SIDDHARTHA	--
9	B13212	GUNTUKU VIKAS	--
10	B13213	KATTA GURU SRIVENKAT	--
11	B13214	KULENDRA KUMAR KAUSHAL	<i>Minor in Management</i>
12	B13215	MD TAHSEEN ALAM	--
13	B13216	MUNINDAR KUMAR MEENA	<i>Minor in Management</i>
14	B13217	NARENDRA KUMAR MEENA	--
15	B13219	PANKAJ KUMAR	--
16	B13220	RAJAT VALECHA	<i>Minor in Management</i>
17	B13221	RISHABH GEHLOT	--
18	B13222	RISHABH TRIVEDI	--
19	B13223	S THEJAS BABU	<i>Minor in Management</i>
20	B13224	SACHIN CHAUDHARY	--
21	B13226	SANJEEV KHARE	<i>Minor in Management</i>
22	B13227	SAURABH GANGWAR	--
23	B13228	SHIVA VERMA	--
24	B13229	SHIVANGI KATARIA	--
25	B13230	SHRI KISNA MAHAJAN	--
26	B13232	SIDDHARTH GANGAL	<i>Minor in German Language And Minor in Management</i>

27	B13233	SUNIL CHOUDHARY	--
28	B13236	TUSHAR JAIN	--
29	B13237	VASUDEV MEENA	--
30	B13238	VIPUL GUPTA	<i>Minor in Management</i>
31	B13239	VIVEK SHARMA	<i>Minor in Management</i>
32	B13126	MANISH KUMAR MEENA	--
33	B13132	PUSHPENDRA KUMAR MEENA	--
34	B13325	RASPREET SINGH	--
35	B13319	NIKHIL KAUSHIK	<i>Minor in Management</i>
36	B13321	ONKAR SINGH	<i>Minor in Management</i>
37	B13328	S V JYOTHIR ADITYA	<i>Minor in Management</i>
38	B12085	PERAM AKHIL	--

h) **Bachelor of Technology (B.Tech.) in Mechanical Engineering**

28 students have completed all the requirements for the award of 'Bachelor of Technology' degree in Mechanical Engineering. Their names and Roll. Nos. are as given below:

Sl. No.	Roll No.	Student Name	Degree Awarded with
1	B13301	ALPNA TYAGI	--
2	B13302	ANKIT KUMAR MEENA	<i>Minor in Management</i>
3	B13303	ANKUR KUMAR SINGH	--
4	B13306	BHISHM TAHILIANI	--
5	B13307	D.AMAR SIMHA YADAV	--
6	B13308	GAJENDRA PRAJAPATI	--
7	B13309	GAURAV KOHALI	--
8	B13310	GAURAV PRAJAPATI	--
9	B13311	HARSHIT KUMAR	--
10	B13313	LALIT SHAKYWAL	--
11	B13314	M SHRI HARIKRISHNAN	--
12	B13315	MAHAJAN KARAN SURYAKANT	--
13	B13316	MANAS KUMAR	<i>Minor in German Language</i>
14	B13317	MAYANK TEWATIA	--
15	B13320	NIKHIL SASI RAJAN	--
16	B13322	PAWAN KUMAR MEENA	--
17	B13323	PRAMOD VERMA	--
18	B13324	PRINCE GARG	--
19	B13326	RAVI SIROHI	--
20	B13329	SAGAR KUMAR PEDDINTI	--
21	B13330	SAKET SAURABH	--
22	B13331	SHAILENDRA PAL MEENA	--
23	B13332	SHAILY BANSAL	--
24	B13333	SIVARAPU ADITYA KRISHNA	--
25	B13335	SUBHANKAR DAS	--
26	B13336	SUMIT CHAHAL	--
27	B13338	VINEET YADAV	--
28	B13340	YASHU MADAAN	--

18.4 One Time Approval (OTA)/Approval of the courses as per Senate approved nomenclature for the courses already taken up by the graduating students:

A list of courses taken by students graduating in 5th Convocation for one time approval by the Senate. The list is placed as Annexure-A. The BoA recommended it to the Senate for approval. Further, the courses taken by the students who had gone under Students Exchange Programmes at foreign universities are recommended for approval. The list of courses is placed at Annexure-'B'.

18.5 To consider approval of courses presented by the Course Proposal Committee (CPC):

The Chairperson, presented the following ten courses to BoA:

- (i) CS 507 – Computer Architecture*
- (ii) CS 562 – Artificial Intelligence**
- (iii) EE 523 –Digital VLSI Architecture Design
- (iv) EE 524 – Digital MOS LSI Circuits
- (v) EE 526 – Power Semiconductor Devices
- (vi) EE 529 – Embedded Systems
- (vii) EE 622 - Microwave Integrated Circuits
- (viii) DP 591 – Project (Part-1)
- (ix) DP 592 – Project (Part-2)
- (x) CY 600 - Photocatalysis: Fundamentals and Applications

After due deliberations the BoA recommended all the courses for approval by the Senate with modification in EE 622, EE 529, DP 591, DP 592 and CY 600.

* The course CS507 is approved in 12th Senate. The course name of CS507 is changed to "Computer Architecture". Old name was "Advanced Computer Architecture". Credit structure is also changed from 3-0-0-3 to 3-0-2-4.

** The course is a approved course from IIT Madras. This course is offered earlier (still offering) with the course code CS305. Now onwards, this course will be offered with the new course code CS562.

The recommended/modified courses are placed as Annexure – 'C'.

18.6 To consider recommendations of the committee constituted in 17thBoA on conversion of B.Tech to Integrated M.Tech& M.Sc./M.Tech to Integrated Ph.D.

The Board deliberated and advised the committee to submit more explained proposal after discussion with all schools through CIG. Deferred till next BoA.

18.7 To consider use of DSPACE (Institute's digital repository):

The Board deliberated and considered that the proposal may be considerable for thesis submitted for M.S./Ph.D. programmes. The proposal was deferred till next meeting of BoA with an advice that the proposal be submitted with deliberated explanations keeping in view the legality on the issue.

18.8 To consider proposal for M.Tech in Civil Engineering with Specialization in Structural Engineering

The Board deliberated and advised the committee to submit more explained proposals through CIG and deferred till next BoA.

18.9 To consider Master's programme in Development Studies to commence in August 2018

The Board deferred it till next BoA and advised that modified proposal as per discussion be submitted after CIG recommendations.

18.10 Any other item with the permission of the Chair.

-NIL-

Abhaidly
22.09.17

Chairman, Board of Academics



Secretary, Board of Academics

Annexure - A

Approval for the courses taken by graduating batch of B.Tech, M.S., Ph.D., M.Tech students.

Sl. No.	Course No (Credits in bracket)	Course Name	Remarks	Approval
1	EE-312P (2)	Microelectronic Circuit Practicum	In 10th senate course name was approved Microelectronics Circuits Design Practicum	
2	EN-503(3)	Energy Storage Devices	In 9th senate course name was approved Energy Storage Technologies	
3	EE-208P(2)	Digital System Design	In 12 th Senate course name was approved Digital Systems Design Practicum	OTA in 2 nd convo (15 th March 2015)
4	ME-356(3)	Principles Of Energy Conversion	Approved with 4 credits in 3rd senate	
5	ME-502(3)	Nano Manufacturing	Approved by Chairman Senate ME - 509	
6	CS-601(3)	Probability and Random Processes	Approved in 10th senate with 4 credits	
7	ME-623(3)	Fundamentals of Fracture Mechanics	Approve in 8 th Senate with Course Code ME-506(3)	
8	HS-540(4)	Environment Policy and Law	Approved in 10th senate with course no. EN-504	
9	EM-601(4)	Materials for Energy Applications	Approved in 8th senate with course no. EM-504	
10	HS-392(3)	Modern China: A Historical Survey	Approved in 9 th senate with course no. HS- 364	

Annexure - A

Approval for the courses taken by graduating batch of B.Tech, M.S., Ph.D., M.Tech students. The following courses have been approved either by the Senate or by the Chairman Senate with either different course number or credit or course name:

Sl. No.	Course No (Credits in bracket)	Course Name	Remarks	Approval
1	EE-312P (2)	Microelectronic Circuit Practicum	In 10th senate course name was approved Microelectronics Circuits Design Practicum	
2	EN-503(3)	Energy Storage Devices	In 9th senate course name was approved Energy Storage Technologies	
3	EE-208P(2)	Digital System Design	In 12 th Senate course name was approved Digital Systems Design Practicum	OTA in 2 nd convo (15 th March 2015)
4	ME-356(3)	Principles Of Energy Conversion	Approved with 4 credits in 3rd senate	
5	ME-502(3)	Nano Manufacturing	Approved by Chairman Senate ME - 509	
6	CS-601(3)	Probability and Random Processes	Approved in 10th senate with 4 credits	
7	ME-623(3)	Fundamentals of Fracture Mechanics	Approve in 8 th Senate with Course Code ME-506(3)	
8	HS-540(4)	Environment Policy and Law	Approved in 10th senate with course no. EN-504	
9	EM-601(4)	Materials for Energy Applications	Approved in 8th senate with course no. EM-504	



Approval for the courses taken by graduating batch of B.Tech, M.S., Ph.D., M.Tech students. The following courses had one time approval for different convocations. However, these courses were not approved by the Senate.

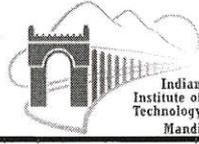
Sl. No	Course No. (Credits)	Course Name	Remarks	Faculty	Offered Sem
1	CS-547(3)	Network Management Systems	Approved in convocation adhoc (20 oct 2013)	Prof. T.A. Gonsalves	5th sem (Aug-Dec 2015)
2	HS-252(3)	Introduction To Psychology	Approved in convocation adhoc (20 oct 2013)	Dr. Shail Shankar	5th sem (Aug-Dec 2015)
3	ME-355(3)	Internal Combustion Engine	Approved in convocation adhoc (20 oct 2013)	Dr. Atul Dhar	6th sem (Jan-July 2016)
4	PH-702(3)	Theoretical Atomic Physics	OTA in 2 nd convo (15 th March 2015)	Dr. Hari Varma	Aug- Dec 2014
5	EE-304P(1)	Communication Theory Lab	OTA in 3 rd convo (30 th Oct, 2015)	Dr. Renu M	5th sem (Aug-Dec 2015)
6	BY-607(3)	Genomics Metagenomics and Next Generation Technology	Not Approved	Dr. Tulika Srivastava	Aug-Dec 2013





Approval for the courses taken by graduating batch of B.Tech, M.S., Ph.D., M.Tech students.

Sl. No.	Course Code (Credits in bracket)	Course Name	Remarks
1	ME-622(3)	Mechanics of Human Body	Not Approved



Approval for the courses taken by graduating batch of B.Tech, M.S., Ph.D., M.Tech students. The following courses have never been approved either by the Senate or by the Chairman Senate.

Sl. No.	Course Code (Credits in bracket)	Course Name	Remarks
1	HS-392(3)	Modern China: A Historical Survey	Not Approved
2	ME-622(3)	Mechanics of Human Body	Not Approved

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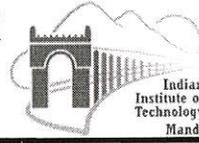
Approval for the courses taken by graduating batch of B.Tech. students through Semester Exchange

Sl. No.	Course Code (Credits in bracket)	Course Name	Remarks
1	1010003E(5)	INTRODUCTION TO DATABASE DESIGN	Course taken at ITU of Copenhagen, Denmark through Semester Exchange Programme
2	1012001E(5)	INTELLIGENT SYSTEMS PROGRAMMING	Course taken at ITU of Copenhagen, Denmark through Semester Exchange Programme
3	2813001E(5)	BUSINESS AND MANAGEMENT FOUNDATIONS	Course taken at ITU of Copenhagen, Denmark through Semester Exchange Programme
4	KBBIDAP1KE(5)	BIG DATA PROCESSES	Course taken at ITU of Copenhagen, Denmark through Semester Exchange Programme
5	0810003E (5)	DATA MINING	Course taken at ITU of Copenhagen, Denmark through Semester Exchange Programme
6	DV2545 (5)	ADVANCED TOPIC IN COMPUTING	Courses taken at Blekinge Tekniska Hogskola (BTH), Sweden through Semester Exchange Programme
7	PA2537&515(1.67)	RESEARCH METHODOLOGY IN SOFTWARE ENGINEERING AND COMPUTER SCIENCE (RESEARCH PROPOSALS)	Courses taken at Blekinge Tekniska Hogskola (BTH), Sweden through Semester Exchange Programme
8	PA2537&505(1.66)	RESEARCH METHODOLOGY IN SOFTWARE ENGINEERING AND COMPUTER SCIENCE (LITERATURE STUDY)	Courses taken at Blekinge Tekniska Hogskola (BTH), Sweden through Semester Exchange Programme
9	PA2537&525(1.67)	RESEARCH METHODOLOGY IN SOFTWARE ENGINEERING AND COMPUTER SCIENCE (RESEARCH ARTICLE)	Courses taken at Blekinge Tekniska Hogskola (BTH), Sweden through Semester Exchange Programme
10	SV0010(5)	INTRODUCTION TO SWEDISH, LEVEL I	Courses taken at Blekinge Tekniska Hogskola (BTH), Sweden through Semester Exchange Programme
11	SV0011(5)	INTRODUCTION TO SWEDISH, LEVEL II	Courses taken at Blekinge Tekniska Hogskola (BTH), Sweden through Semester Exchange Programme
12	MI2506(5)	ENGINEERING FOR A SUSTAINABLE SOCIETY	Courses taken at Blekinge Tekniska Hogskola (BTH), Sweden through Semester Exchange Programme
13	PA2513(5)	ADVANCED SOFTWARE PROJECT MANAGEMENT	Courses taken at Blekinge Tekniska Hogskola (BTH), Sweden through Semester Exchange Programme
14	PA2515&310(2.67)	APPLIED SOFTWARE PROJECT MANAGEMENT (PROJECT PLAN & EXECUTION)	Courses taken at Blekinge Tekniska Hogskola (BTH), Sweden through Semester Exchange Programme
15	PA2515&320(2.33)	APPLIED SOFTWARE PROJECT MANAGEMENT (FINAL PROJECT REPORT)	Courses taken at Blekinge Tekniska Hogskola (BTH), Sweden through Semester Exchange Programme



16	SL2508(5)	INTRODUCTION TO STRATEGIC SUSTAINABLE DEVELOPMENT	Courses taken at Blekinge Tekniska Hogskola (BTH), Sweden through Semester Exchange Programme
17	0213006E(5)	INTRODUCTION TO SERVICE DESIGN	Course taken at ITU of Copenhagen, Denmark through Semester Exchange Programme
18	1010011E(5)	PROGRAMMING LANGUAGE SEMINAR	Course taken at ITU of Copenhagen, Denmark through Semester Exchange Programme
19	CLA10412(0.66)	TECHNICAL WRITING	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
20	EI7314 (3.33)	BRAIN, MIND AND COGNITION	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
21	IN2003 (5.33)	EFFICIENT ALGORITHMS AND DATA STRUCTURES	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
22	IN2062 (3.33)	TECHNIQUES IN ARTIFICIAL INTELLIGENCE	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
23	IN2040 (4)	VIRTUAL MACHINES	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
24	IN2119 (3.33)	USER MODELING AND RECOMMENDER SYSTEMS	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
25	IN2147 (3.33)	PARALLEL PROGRAMMING	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
26	IN2227(3.33)	COMPILER CONSTRUCTION I	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
27	EI7637 (4)	DATA ANALYSIS FOR COMPUTER ENGINEERING	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
28	WI001057 (4)	COST ACCOUNTING	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
29	ELEC-E7320 (3.33)	INTERNET PROTOCOLS	Course taken at Aalto University (AU), Finland through Semester Exchange Programme
30	ICS-E4000 (3.33)	ARTIFICIAL INTELLIGENCE	Course taken at Aalto University (AU), Finland through Semester Exchange Programme
31	ICS-E4020 (3.33)	PROGRAMMING PARALLEL COMPUTERS	Course taken at Aalto University (AU), Finland through Semester Exchange Programme
32	ICS-E5040 (3.33)	MODERN DATABASE SYSTEMS	Course taken at Aalto University (AU), Finland through Semester Exchange Programme
33	LC-7007 (0.66)	SURVIVAL FINNISH FOR EXCHANGE STUDENTS	Course taken at Aalto University (AU), Finland through Semester Exchange Programme
34	T-61.5010 (3.33)	INFORMATION VISUALIZATION P	Course taken at Aalto University (AU), Finland through Semester Exchange Programme

35	16ss-23376 (3.33)	FROM QUANTUM COHERENCE TO QUANTUM INFORMATION	Course taken at RWTH Aachen University, Germany through Semester Exchange Programme
36	16ss-29840 (4)	MACHINE LEARNING	Course taken at RWTH Aachen University, Germany through Semester Exchange Programme
37	16ss-46565 (2.67)	OXIDE THIN FILMS FOR INFORMATION TECHNOLOGY	Course taken at RWTH Aachen University, Germany through Semester Exchange Programme
38	16ss-02745 (6.67)	SEMINAR: NANOTECHNOLOGY: FROM PHYSICAL PRINCIPLES TO APPLICATION	Course taken at RWTH Aachen University, Germany through Semester Exchange Programme
39	IN2087(3.33)	SOFTWARE ENGINEERING FOR BUSINESS APPLICATIONS	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
40	IN2111 (4)	3D USER INTERFACES	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
41	IN2178 (3.33)	SECURITY ENGINEERING	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
42	EI8032 (3.33)	POWER TRANSMISSION SYSTEMS	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
43	IN2030 (2)	DATA MINING AND KNOWLEDGE DISCOVERY	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
44	IN2064 (5.33)	MACHINE LEARNING	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
45	IN2323 (3.33)	MINING MASSIVE DATASETS	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
46	IN3200 (2.67)	SELECTED TOPIC IN COMPUTER GRAPHICS AND VISION	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
47	EI5032 (4)	COMMUNICATIONS LAB	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
48	EI7434(3.33)	MIXED SIGNAL ELECTRONICS	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
49	EI8031(3.33)	POWER ELECTRONICS	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
50	EI8032(3.33)	POWER TRANSMISSION SYSTEMS	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
51	MW1419(3.33)	THERMODYNAMICS FOR ENERGY CONVERSION	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
52	MW1421(3.33)	DYNAMICS OF MECHANICAL SYSTEMS	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
53	MW1475(2)	RENEWABLE ENERGY TECHNOLOGY I	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme



51	MW2149(3.33)	INTRODUCTION TO WIND ENERGY	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme
55	WI000031(2)	ORGANIZATIONAL PSYCHOLOGY	Course taken at Technical University Munich (TUM), Germany through Semester Exchange Programme

IIT Mandi
Proposal for a Modified Course

Course Number	: CS507
Course Name	: Computer Architecture
Credits	: 3-0-2-4.
Pre-requisite	: CS201 – Computer Organization or Equivalent
Intended for	: BTech Computer Science Engineering (CSE) and Electrical Engineering (EE), MS, M. Tech. & PhD.
Distribution	: Elective for Third and Final year B. Tech (CSE/EE), MS, M. Tech. in VLSI/Signal Processing and Communication & PhD
Semester	: Even or Odd.

1. Preamble:

VLSI technology has been major driving force for phenomenal growth in computing power of processors, and for emergence of new applications. A few years ago, CPUs had nearly 1B transistors, while the recently announced Oracle SPARC M7 CPU will have more than 10B transistors on chip. Similarly, the GT200 GPU (2008) had 1.4B transistors, while the recent Geforce GTX TITAN X GPU has 8B transistors. Early applications were mainly compute intensive whereas newer applications are either data intensive or both data and compute intensive. These applications include weather forecasting, astronomical data analysis, multimedia and gaming applications etc. Since development VLSI technology has reached a level where no major breakthroughs are expected in near future, architects have been exploring alternative design and implementation strategies. The objective of this course is to provide detailed discussion on architectural mechanisms, which exploit parallelism available in programs at various granularities, and programming tools to work with such architectures.

2. Course Modules with Quantitative Lecture Hours:

1. **Introduction** – Defining Computer Architecture, Flynn’s Classification of Computers, Metrics for Performance Measurement **(4 Hours)**
2. **Memory Hierarchy** – Introduction, Advanced Optimizations of Cache Performance, Memory Technology and Optimizations, Virtual Memory and Virtual Machines, The Design of Memory Hierarchy, Introduction to Pin Instrumentation and Cachegrind, Case Study: Memory Hierarchies in Intel Core i7 and ARM Cortex-A8. **(8 Hours)**



3. **Instruction Level Parallelism** – Instruction-level Parallelism: Concepts and Challenges, Basic Compiler Techniques for Exposing ILP, Reducing Branch Costs with Advanced Branch Prediction, Dynamic Scheduling, Advanced Techniques for Instruction Delivery and Speculation, Limitations of ILP, Multithreading: Exploiting Thread-Level Parallelism to Improve Uniprocessor Throughput, Modeling Branch Predictors using Pin Tool, Case Study: Dynamic Scheduling in Intel Core i7 and ARM Cortex-A8. **(10 Hours)**
4. **Thread Level Parallelism** – Introduction, Shared-Memory Multicore Systems, Performance Metrics for Shared-Memory Multicore Systems, Cache Coherence Protocols, Synchronization, Memory Consistency, Multithreaded Programming using OpenMP, Case Study: Intel Skylake and IBM Power8. **(10 Hours)**
5. **Data Level Parallelism** – Introduction, Vector Architecture, SIMD Instruction Set Extensions for Multimedia, Graphics Processing Units, GPU Memory Hierarchy, Detecting and Enhancing Loop-Level Parallelism, CUDA Programming, Case Study: Nvidia Maxwell. **(10 Hours)**

Computer Architecture Lab:

The lab experiments (assignments) will be designed to assist the theory covered in the class.

3. Text Books:

1. J.L. Hennessy and D.A. Patterson. Computer Architecture: A Quantitative Approach. 5 th Edition, Morgan Kauffmann Publishers, 2012.

4. References:

1. J.P. Shen and M.H. Lipasti. Modern Processor Design: Fundamentals of Superscalar Processors. McGraw-Hill Publishers, 2005.
2. D.B. Kirk and W.W. Hwu. Programming Massively Parallel Processors. 2 nd Edition, Morgan Kauffmann Publishers, 2012.
3. Pin – A Dynamic Binary Instrumentation Tool. <https://software.intel.com/en-us/articles/pin-a-dynamic-binary-instrumentation-tool>
4. Cachegrind: A Cache and Branch-Prediction Profiler. <http://valgrind.org/docs/manual/cg-manual.html>
5. OpenMP. www.openmp.org
6. CUDA. <https://developer.nvidia.com/cuda-zone>

5. Similarity Content Declaration with Existing Courses: Nil

6. Justification for new course proposal if cumulative similarity content is > 30%:N/A



Approvals:

Other Faculty interested in teaching this course: Dr. Anil K. Sao, Dr. Dileep A. D.

Proposed by: Dr. B. D. Chaudhary

School: SCEE

Signature: _____

Date: _____

Recommended/Not Recommended, with Comments:

Chairman, CPC

Date: _____

Approved/Not Approved

Chairman, Senate

Date: _____

Note:

- The course CS507 is approved in 12th Senate.
- The course name of CS507 is changed to “Computer Architecture”. Old name was “Advanced Computer Architecture”.
- Credit structure is also changed from 3-0-0-3 to 3-0-2-4.
- The course has been discussed in CIG including Prof. B. D. Chaudhary, Dr. Anil K. Sao, Dr. Dileep A. D. and Dr. Subhojit Roy Chowdury and content has been modified as per their suggestion.



IIT Mandi
Proposal for a Modified Course

Course Number	: CS562
Course Name	: Artificial Intelligence
Credits	: 3-0-0-3.
Pre-requisite	: IC250 - Programming and Data Structure Practicum or Equivalent, CS202 – Data Structure and Algorithm or Equivalent, CS403 - Algorithm Design and Analysis or Equivalent, COT
Intended for	: B. Tech, MS, M. Tech. & PhD.
Distribution	: Elective for Third and Final year B. Tech (All branches), MS, M. Tech. & PhD
Semester	: Even or Odd.

1. Preamble:

For an autonomous agent to behave in an intelligent manner it must be able to solve problems. This means it should be able to arrive at decisions that transform a given situation into a desired or goal situation. The agent should be able to imagine the consequence of its decisions to be able to identify the ones that work. In this introductory graduate level course on artificial intelligence (AI) we study a wide variety of search methods that agents can employ for problem solving.

2. Course Modules with Quantitative Lecture Hours:

1. **Introduction:** Overview and Historical Perspective, Turing Test, Physical Symbol Systems and the scope of Symbolic AI, Agents. **(3 hours)**
2. **State Space Search:** Depth First Search, Breadth First Search, DFID **(3 hours)**
3. **Heuristic Search:** Best First Search, Hill Climbing, Beam Search **(3 hours)**
4. Traveling Salesman Problem, Tabu Search, Simulated Annealing **(3 hours)**
5. **Population Based Search:** Genetic Algorithms, Ant Colony Optimization **(3 hours)**
6. Branch & Bound, Algorithm A*, Admissibility of A* **(3 hours)**
7. Monotone Condition, IDA*, RBFS, Pruning OPEN and CLOSED in A* **(3 hours)**
8. Problem Decomposition, Algorithm AO*, Game Playing **(3 hours)**
9. **Game Playing:** Algorithms Minimax, AlphaBeta, SSS* **(3 hours)**
10. Rule Based Expert Systems, Inference Engine, Rete Algorithm **(3 hours)**
11. **Planning:** Forward/Backward Search, Goal Stack Planning, Sussman's Anomaly **(3 hours)**
12. Plan Space Planning, Algorithm Graph plan **(3 hours)**
13. Constraint Satisfaction Problems, Algorithm AC-1, Knowledge Based Systems **(3 hours)**
14. Propositional Logic, Resolution Refutation Method **(3 hours)**



3. Text Books:

1. Deepak Khemani. A First Course in Artificial Intelligence, McGraw Hill Education (India), 2013.

4. References:

1. John Haugeland, Artificial Intelligence: The Very Idea, A Bradford Book, The MIT Press, 1985.
2. Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, A K Peters/CRC Press; 2nd edition, 2004.
3. Eugene Charniak and Drew McDermott, Introduction to Artificial Intelligence, Addison-Wesley Publ., 1985.
4. Zbigniew Michalewicz and David B. Fogel. How to Solve It: Modern Heuristics. Springer; 2nd edition, 2004.
5. Judea Pearl. Heuristics: Intelligent Search Strategies for Computer Problem Solving, Addison-Wesley, 1984.
6. Elaine Rich and Kevin Knight. Artificial Intelligence, Tata McGraw Hill, 1991.
7. Stuart Russell and Peter Norvig. Artificial Intelligence: A Modern Approach, 3rd Edition, Prentice Hall, 2009.
8. Patrick Henry Winston. Artificial Intelligence, Addison-Wesley, 1992.
9. Stefan Edelkamp and Stefan Schroedl. Heuristic Search: Theory and Applications, Morgan Kaufmann, 2011.

5. Similarity Content Declaration with Existing Courses: None

6. Justification for new course proposal if cumulative similarity content is > 30%: N/A



Approvals:

Other Faculty interested in teaching this course:

Proposed by: Deepak Khemani

School: SCEE

Signature: _____

Date: _____

Recommended/Not Recommended, with Comments:

Chairman, CPC

Date: _____

Approved/Not Approved

Chairman, Senate

Date: _____

Note:

- The course is a approved course from IIT Madras.
- This course is offered earlier (still offering) with the course code CS305. Now onwards, this course will be offered with the new course code CS562.



IIT Mandi
Proposal for a New Course

Course Number	: EE523
Course Name	: Digital VLSI Architecture Design
Credits	: 3-0-2-4.
Pre-requisite	: IC161 - Applied Electronics, EE312P-Microelectronics Circuit Design Practicum, EE208P-Digital System-Design Practicum or Equivalent
Intended for	: Final year BTech Electrical Engineering (EE), MS, M. Tech. & PhD.
Distribution	: Elective for Final year B. Tech (EE), MS, M. Tech. & PhD
Semester	: Even or Odd.

1. Preamble:

This course has been design to compressively understand the digital architectural designs of very-large scale-integration (VLSI) systems as seen in complex system-on-chips (SoCs). It delivers overall understanding of VLSI architectures compliant to signal processing/communication systems and sub-systems with the notion of optimization for area, speed, power dissipation, cost and reliability. Additionally, it emphasizes on the architectural design of array systems and its use in various applications. It will encompass within its folds traditional and state of the art digital VLSI architectures optimized for specific purposes.

2. Course Modules with Quantitative Lecture Hours:

1. **Introduction:** Review of VLSI design flow, goals of VLSI design: optimization of speed, power dissipation, cost and reliability. **[2 hours]**
2. **System Design Flow & Fixed-point Arithmetic:** Overview, system design flow, representation of numbers, floating point format, $Qn.m$ format for fixed point arithmetic, floating-point to fixed-point conversion, block floating-point formats, forms of digital filters. **[2 hours]**
3. **Algorithm to Architecture Transformation:** Architectural antipodes, transform approach to VLSI architectures, graph based formalism for describing processing algorithms, isomorphic architecture. **[3 hours]**
4. **Equivalence Transforms for Combinational Computations:** Common assumptions, pipelining, replication, time sharing, associatively transform and other algebraic transforms. **[5 hours]**



5. **Clocking of Synchronous Circuits:** Single-phase and two-phase clocking, wave pipelining, collective clock-buffer design, distributed clock-buffer trees, hybrid-clock distribution networks, impact of clock distribution delay on input/output (I/O) timing. **[6 hours]**
6. **Asynchronous Data Processing Architectures:** Data consistency problem of vectored acquisition-plain bit parallel synchronization, unit distance coding, suppression of cross patterns, handshaking, partial handshaking, data consistency problem of scalar acquisition-synchronization at single place, synchronization at multiple places, synchronization from a slow clock, meta-stable synchronizer behavior. **[5 hours]**
7. **Digital Signal Processing Using Array Architectures:** Systolic and wave-front arrays, mapping dependence and signal flow graphs to systolic and wave-front arrays, asynchronous communication protocols for wave-front arrays. **[5 hours]**
8. **Architectural Synthesis and Optimization:** Circuit specifications for architectural synthesis, fundamental architectural synthesis problems, temporal domain-scheduling, spatial domain-binding, sequencing graphs, hierarchical models, synchronization problem, area and performance estimation, data path and control unit synthesis, constrained and unconstrained scheduling, scheduling of pipelined circuits. **[8 hours]**
9. **CORDIC Based Architectures:** Introduction, CORDIC algorithm for hardware implementation, hardware mapping, time-shared architecture, C-slow time shared architecture, modified CORDIC algorithm, recording of binary representation as ± 1 , hardware optimization, optimal hardware design for CORDIC. **[2 hours]**
10. **Digital Design of Communication Systems:** Top-level design options: bus-based design, point-to-point design, network-based design, hybrid connectivity, point-point KPN-based top-level design, KPN with shared bus and DMA controller, network-on-chip (NoC) top-level design, design of a router for NoC, run-time configuration, NoC for software defined radio. Typical digital communication system: source encoding, data compression, encryption, channel coding, framing, modulation, digital up-conversion and mixing, front end of the receiver. **[4 hours]**

3. Text Books:

1. Hubert Kaeslin, "Digital Integrated Circuit Design: From VLSI Architectures to CMOS Fabrication", Cambridge University Press (2009).
2. Giovanni De Micheli, "Synthesis and Optimization of Digital Circuits", McGraw Hill (2012).

4. References:

1. A.M. Fahim, "Clock generators for SoC processors: Circuits and Architectures", Kluwer Academic Publishers (2005).



2. Magdy A. Bayoumi, "VLSI Design Methodologies for Digital Signal Processing Architectures", Springer (2012).
3. Shoab Ahmed Khan, "Digital Design of Signal Processing Systems – A Practical Approach", Wiley (2011).
4. S.Y. Kung, "VLSI Array Processors", Prentice Hall (2012).

5. Similarity Content Declaration with Existing Courses:

S.N.	Course Code	Similarity Content	Approx. % of Content
1.	IC161	Number System in Digital Electronics.	2%

6. Justification for new course proposal if cumulative similarity content is > 30%: N/A

Approvals:

Other Faculty interested in teaching this course:

Proposed by: Dr. Rahul Shrestha

School: SCEE

Signature: _____

Date: _____

Recommended/Not Recommended, with Comments:

Chairman, CPC

Date: _____

Approved/Not Approved

Chairman, Senate

Date: _____

Note:

The course has been discussed in CIG and modified as per their suggestion.

IIT Mandi
Proposal for a New Course

Course Number	: EE524
Course Name	: Digital MOS LSI Circuits
Credits	: 3-0-0-3.
Pre-requisite	: IC161 - Applied Electronics or Equivalent, EE311-Device Electronics for Integrated Circuits or Equivalent
Intended for	: BTech Electrical Engineering (EE), M. Tech., MS & PhD.
Distribution	: Elective for Third and Final year B. Tech (EE), MS, M. Tech. & PhD
Semester	: Even or Odd.

1. Preamble:

The main objective of this course is to teach the students to analyze and synthesize digital logic CMOS circuits of LSI complexity. The students will learn the theory for designing digital logic circuits and logic system designs. The course would help the student to formulate and use the computational models to solve problems of physical design types which includes the development of geometric floor plan for the physical layout for the architecture of the circuit design. The course aims to give exercise and IC project design by which the students learn to manage a computer based graphic editor for physical circuit layouts and to verify the design behavior specification using a simulator.

2. Course Modules with Quantitative Lecture Hours:

- 1. Introduction:** An overview of IC development and trends. A review of basic properties of MOS transistors and device physics relevant for digital logic design. CMOS process technology, layout and design rules. **(5 hours)**
- 2. CMOS Inverter:** Static CMOS inverter, static behavior – switching threshold, noise margin, robustness. Dynamic behavior capacitance computation, propagation delay- first order analysis, power, energy and energy delay. **(3 hours)**
- 3. Combination logic gates in CMOS:** Static CMOS design – complementary CMOS, Ratioed Logic, Pass transistor logic- dynamic CMOS Design – dynamic logic principles, speed and power dissipation, issues in dynamic design, cascading dynamic gates, designing logic for reduced supply voltage, simulation and layout techniques for complex gates. **(5 hours)**
- 4. Sequential logic circuits in CMOS:** Timing metrics for sequential circuits, memory element classifications, static latches and Registers, dynamic latches and Registers,



Alternative register styles – pulse and sense amplifier based registers, pipelining, Non Bi stable sequential Circuits, Choosing clock strategy. **(5 Hours)**

5. **Design Criteria: Introduction** – Custom, semi custom and structured array design approaches, cell based Design methodology, Array based implementations – pre-diffused – pre-wired arrays, characterizing logic and sequential cells **(5 Hours)**
6. **Interconnect:** Coping with interconnect , capacitive parasitics – cross talk, resistive parasitics – Ohmic voltage drop- electromigration-RC delay, inductive parasitics – voltage drop – transmission line effects, advanced interconnect techniques – reduced Swing Circuits – Current – mode transmission Techniques. **(4 hours)**
7. **Timing issues:** Timing classification of digital systems, synchronous interconnect, Synchronous timing basics, source of skew and jitter, clock distribution techniques and latch based clocking, self timed circuit design- clock synthesis and synchronization using a phase Locked loop **(5 hours)**
8. **Design verification:** Datapaths in digital Processor architectures, the adder, multiplier, shifter, power and speed tradeoffs in datapath structures -memory architecture and buliding blocks, memory core, peripheral cicuit, reliability and yield, power dissipation. **(5 hours)**
9. **Design for Testability:** issues in design for testability, ad hoc testing, scan based testing, boundary scan design, Built in self Test, test pattern generation, fault models. **(5 hours)**

3. Text Books:

1. Neil H.E. Weste and Harris D M, “CMOS VLSI Design: A circuit and Systems Perspective ” Fourth Edition, Addison Wesley (2011).ISBN 10: 0-321-54774-8 / ISBN 13:978-0-321-54774-3

4. References:

1. Jan M. Rabaye, Digital Integrated Circuits: A Design Perspective (2nd Edition) Prentice-Hall 2003, ISBN 0-13-120764-4
2. Ken Martin, “Digital Integrated Circuit Design”, Oxford University Press (2000).
3. Sung-Mo Kang, Yusuf Leblebici, “Digital Integrated Circuits: Analysis and Design”, McGraw-Hill, 2002, ISBN:0071196447
4. A. Chandrakasan, W. Bowhill, F. Fox, “Design of High Performance Microprocessor Circuits”, IEEE Press, 2000, ISBN 078036001-X
5. John P. Uyemura, Thomson, “Chip Design for Submicron VLSI: CMOS Layout and Simulation”, 1st Edition, 2005, ISBN:053446629X

5. Similarity Content Declaration with Existing Courses: Nil



6. Justification for new course proposal if cumulative similarity content is > 30%: N/A

Approvals:

Other Faculty interested in teaching this course: Dr Hitesh Shrimali , Dr Srikant Srinivasan

Proposed by: Dr. Rajinikumar Ramalingam

School: SCEE

Signature: _____

Date: _____

Recommended/Not Recommended, with Comments:

Chairman, CPC

Date: _____

Approved/Not Approved

Chairman, Senate

Date: _____

Note:

The course has been discussed in CIG and modified as per their suggestion.



IIT Mandi

Proposal for a New Course

Course Number : EE622

Course Name : Microwave Integrated Circuits

Credits : 3-0-0-3

Prerequisite : EE507 – Transmission Lines and Basic Microwave Engineering or equivalent, PH521 – Electromagnetic Theory or equivalent,

Intended for : BTech Third and Final year/M.Tech./MS/PhD

Distribution : Elective for third and final year Electrical Engineering, MTech VLSI, and Communication and Signal Processing (CSP), MS, PhD

Semester : Odd (Aug-Dec)

1. **Preamble:** The proposed course is an advance course towards Microwave Integrated Circuits (MIC) which covers topics like, power-dividers, couplers, printed filters etc. This course will also cover stability analysis of active microwave devices like Amplifiers and oscillators. This course is combination of both passive printed and some of the solid-state devices. To make student aware of latest techniques topics like dielectric resonators, Left-Handed transmission lines are also added. Course objective is to make student to understand following aspects of Microwave Integrated Circuits:

- a) Printed circuits and losses in printed transmission lines. Matching techniques in printed transmission lines.
- b) Working of basic passive components like power-dividers and couplers.
- c) Microwave transistors and amplifiers with their applications. Substrate analysis for Microwave and Millimeter waves.

2. Course Module with quantitative lecture hours:

Module 1. Introduction to Printed Transmission lines and Transitions – Concept of 2 Port-Network and S Parameters, Matching transmission line sections and theory of multiple reflections, Transitions in different transmission lines, Micro-Strip and Strip lines, Left handed transmission lines. Smith chart: Double stub Matching. **[8 hours]**

Module 2. Power Dividers and Directional Couplers: Basic Properties of power dividers and couplers, T junctions, Wilkinson type, quadrature hybrid power dividers, coupled line directional coupler, 90 deg. and 180 deg. - Hybrid branch line couplers. Circulators-Active and Passive. Broad-Band techniques **[6 hours]**

Module 3. Filters and Isolator - Basic Filter design techniques like image parameter and insertion loss, Filter transformations and implementations, low pass filters, coupled line filters, coupled resonator based filters, metamaterial filters. Ferrite isolator circuits and design [6 hours]

Module 4. Microwave Amplifiers, - Single Stage Transistor amplifier, Power gain equations, Stability circles, Broad-band amplifier design, Solid state Power amplifiers. [8 hours]

Module 5. Microwave diodes and transistors: BJT, GaAs FETs, and their applications, IMPATT, TRAPATT, Gunn diodes. [4 hours]

Module 6. Oscillators and Phase-Shifters - Microwave oscillators using Transistors, dielectric resonators, Active and passive Phase-Shifters [6 hours]

Module 7. Technologies in MIC: - Monolithic and Hybride substrates, Metamaterial substrates, Millimeter wave techniques, Simulations based study of printed microwave device [4 hours]

Note: All the Units will have tutorials and in the end of course there will be a presentation assignment in which student (or a group) will present latest advancement in any-one of the topics taught in class

3. Text Book:

1. David M Pozar: Microwave Engineering, Fourth Edition, John Wiley & Sons Publications
2. G. Gonzalez, "Microwave transistor amplifier; design and analysis, Handbook", 2nd addition. Prentice hall Publications.

4. Reference:

1. Leo Young and H. Sobol, Ed. Advances in Microwaves, vol.2 Academic press. Inc.
2. S. Y. liao, "Microwave circuit and analysis and amplifiers design", Prentice Hall.
3. C. Caloz and T. Itho, "Electromagnetic Metamaterial: Transmission Line Theory and Microwave Applications", Wileys Publications. Research Papers as instructed by course Instructors.

5. Similarity content declaration with existing courses:

S.N.	Course code	Course Content	Approx. % of content

1.	EE-526	Power Semiconductor Devices	10%
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6. Justification for new course proposal if cumulative similarity content is > 30%: Nil

Approvals:

Other faculty interested in teaching this course:

Proposed by: Gopi Shrikanth Reddy School: SCEE

Signature: Date: -----

Recommended/Not Recommended

----- Date: -----

Chairman, CPC

Approved/Not Approved

----- Date -----

Chairman, Senate

Note:

This course has been discussed in CIG and contents are modified as per the suggestions.

IIT Mandi

Proposal for a New Course

Course number : EE526

Course Name : Power Semiconductor Devices

Credit : 3-0-0-3

Prerequisite : IC160-Applied Electronics or equivalent, EE311-Device electronics for integrated circuit or equivalent

Intended for : BTech Third and Final year/M.Tech./MS/PhD

Distribution : Elective for third and final year Electrical Engineering, M.Tech. Power Electronics and Drives (PED), M.Tech VLSI, MS, PhD

Semester : Even/Odd

1. Preamble:

This course designed to build up an in-depth understanding among the UG/PG students about the semiconductor devices for power applications. The major goal of this course is to make the students familiarized with different power device structure and fabrications to demonstrate the basic concepts of different device operations and their characteristics for real world applications. Engineering of devices structure for extended current and voltage limit along with the operating frequency for emerging power applications are integral part of the course. Additionally, it will introduce concepts of different wide-bandgap semiconductors and their structural engineering such as quantum well for high power density requirements. Moreover, the modern fabrication challenges and associated device performances will also be presented such as hetero-epitaxy and defects in devices. In brief, the objective of this course is to provide a detail understanding of the state of the art power semiconductor device operation and technologies.

2. Course Modules with quantitative lecture hours:

Module: 1 Introduction and Emergence of power semiconductor devices [2 hours]

Overview of energy intensive civilization and its growth, impact on sustainable world, circuit requirements from power devices, power devices requirements from materials.

Module: 2 Materials Properties and Transport Physics [6 hours]

Basics of semiconductor physics, polarization, quantum structures, bandgap narrowing, impact ionization, resistivity, recombination, scattering.

Module: 3 Semiconductor Junctions [4 hours]

Review of p-n junction and metal-semiconductor junction, heterojunction, insulator-semiconductor junction, Zener and avalanche breakdown, design of breakdown voltage and edge terminations, parasitic circuit elements in rectifiers.

Module: 4 Power Diodes and rectifiers [4 hours]

Power Schottky rectifiers, forward conduction and reverse blocking, device capacitance and thermal analysis, P-i-N rectifiers, switching performance.

Module: 5 BJT for Power Application [4 hours]

Structure, operating principle, current gain, emitter current crowding, output and on-state and switching characteristics, Darlington configuration.

Module: 6 Power MOSFETs and HEMTs [6 hours]

Ideal specific on-resistance, device structure and operation, characteristics, blocking voltage, VD-MOSFET, U-MOSFET, high frequency operation, switching characteristics, heterostructure, triangular potential well, 2DEG, charge control model, small-signal characteristics, power-frequency limit.

Module: 7 Thyristors [4 hours]

Structure and operation, blocking and on-state and switching characteristics, Gate Turn-Off thyristor and triac structure and operations.

Module: 8 Insulated Gate Bipolar Transistor [4 hours]

Structures, operation and output characteristics, equivalent circuit, blocking and on-state characteristics, current saturation model, power loss optimization, superjunction.

Module: 9 Widebandgap semiconductors and Advanced Technologies [8 hours]

Properties and advantages of SiC and GaN, shielded technology, lateral and vertical device, enhancement mode device, reliability aspects, fabrication, homo-epitaxy, hetero-epitaxy, molecular beam epitaxy, metal organic chemical vapor deposition, packaging and thermal management, power IC, integration of devices with CMOS, oxide electronics.

- Students will perform one project/practical work based on modeling, simulation with Technology Computer Aided Design (Synopsys Sentaurus/ Silvaco ATLAS) or fabrication for further improvement of devices performances as instructed.

3. Text books:

1. B. J. Baliga, Fundamentals of Power Semiconductor Devices ,Springer, 2008, ISBN 978-0-387-47314-7
2. Yung C Liang and Ganesh S Samudra, Power Microelectronics: Device and Process Technologies, World Scientific, ISBN-13: 978-9812791009.

4. References:

1. B. Streetman and S. Banerjee, Solid State Electronic Devices, 7th Edition, 2006, ISBN 013149726.
2. S.M. Sze, Physics of Semiconductor Devices, 2nd ed., Wiley, 2008
3. M. Meneghini, G. Meneghesso, E. Zanoni, Power GaN Devices: Materials, Applications and Reliability, Springer, 2017, ISBN 978-3-319-43199-4.
4. Ned Mohan, Tore M. Undeland, Riobbins, Power electronics: converters, applications, and design, Wiley, 2007, ISBN-10: 8126510900
5. R.S. Ramshaw, Power Electronics Semiconductor Switches, Chapman & Hall, 2013, ISBN 9781475762198.

5. Similarity Content declaration with existing courses: <15%

**6. Justification of new course proposal if cumulative similarity content is >30%:
NA**

Approvals:

Other Faculty interested in teaching this course: –

Proposed by: Dr. Ankush Bag School: SCEE

Signature: Date: April 17, 2017

Recommended/Not Recommended, with Comments:

_____ Date: _____

Chairman, CPC

Approved / Not Approved

_____ Date: _____

Chairman, Senate

Comments from Peers/Reviewers and Response:

Comment 1: Reduce the number of modules

Response: Number of modules has been decreased as per the suggestion to offer in-depth and timely coverage of the subject while the essence of course has not been compromised,

Comment 2: Incorporation of brief review needed for PG students coming from different background.

Response: Module 2 and 3 is to bridge the gap for PG students and prepare base for the in-depth subject

Comment 3: Include some devices design, simulation or hands on session.

Response: It has been included and grading will be done considering the same.

Comment 4: Suggestion of some books

Response: It has been included.

Comment 4: Similarity with course "Device Electronics for Integrated Circuit (EE311)" for certain modules with name like BJT, MOSFET.

Response: Due to historical legacy, the nomenclature of some of the device name from which the module name has been derived may look to have similarity with EE311. However, the content and the device architecture are completely different for power application than the general one taught at undergrad level. As mentioned before, a brief review of undergrad knowledge is necessary primarily for PG students coming for with different background as in module 2 and 3. However, the similarity percentage of it will not cross above 15%.

Comment 5: Very good course. Please think if some modeling assignment can be included. References/text books need to be with complete information like year of publication, edition etc.

Response: Modeling assignment part has been included. Details are provided.

Comment 6: Timely course. I would suggest that the following book be included in the list of recommended books.

POWER MICROELECTRONICS: Device and Process Technologies

by Yung C Liang and Ganesg S Samudra, World Scientific, ISBN-13: 978-9812791009, ISBN-10: 9812791000

Response: Included

Comments from CPC: *Similarity content is not done properly, IC160, IC160P should be checked. Also another course offered by Dr. Satinder Sharma must be checked. Text book only one or two. Others may be shifted to reference books.*

Response: Similarity content has been checked with most relevant course EE311 and justified in comment 4 above. Surprisingly there is no content similarity with IC160 or IC160P i.e. Electrical Systems Around Us and its practicum. However, as per the terminology, IC161 and EE615 (Dr. Satinder Sharma's course) may have the similarity of less than 5% and 14% respectively. Moreover, as mentioned before that content or device architecture wise there is no identical course offered at IIT Mandi with EE526 as of now.

Text books have been reduced as suggested.

****Comments are mostly provided verbally by CIG members. Few responses are by email as stated:**



IIT Mandi
Proposal for a New Course

Course Number	: EE529
Course Name	: Embedded Systems
Credits	: 3-0-2-4.
Pre-requisite	: IC161 - Applied Electronics, CS201 – Computer Organization or any course on microprocessors or Equivalent
Intended for	: BTech Computer Science Engineering (CSE) and Electrical Engineering (EE), MS, M. Tech. & PhD.
Distribution	: Elective for Third and Final year B. Tech (CSE/EE), MS, M. Tech. in VLSI/Signal Processing and Communication/Power Electronics and Drives & PhD
Semester	: Even or Odd.

1. Preamble:

The Embedded Systems course aim at building up an in depth understanding among the advanced B.Tech / M.Tech / M.S./ Ph.D students of embedded systems architecture, design space exploration and design optimization of embedded systems through a perfect synergy of class lectures and hands on assignments. The goal is to illustrate the concepts discussed in the classroom teaching and to give students an opportunity to build, feel and test real systems. Since the embedded systems of today are centered around a wide variety of embedded cores such as micro-controllers and FPGA, topics in lecture should focus around the system design issues with the different types of embedded cores. Finally, topics of recent interest such as hardware software co-design, Internet of Things give the student an idea of the state of the art technological practices in Embedded Systems.

2. Course Modules with Quantitative Lecture Hours:

- 1. Introduction to embedded systems:** Understanding an embedded system, design metrics, design challenges, technologies for embedded systems. **(2 Lectures)**
- 2. Custom Single Purpose Processor for Embedded Systems:** Design of data-paths and controllers, finite state machines, custom single purpose processor design at RT level, optimizing custom single purpose processors. **(3 Lectures)**
- 3. Hardware Description Language:** Introduction to hardware description language, overview of structural, behavioral and dataflow modeling of digital systems using hardware description language, notion of finite state machines, delay modeling, memory modeling, synthesizable & non-synthesizable HDL codes for digital system design. **(3 Lectures)**

4. **Introduction to FPGA:** Introduction to complex digital systems design, notion of programmable logic devices, overview of FPGA architecture, realization of data-path and controller, timing analysis of data-path and controller, synthesis, placement, routing, performance optimization. **(3 Lectures)**
5. **FPGA based systems design:** Implementation of simple systems using FPGA exercising the timing closure paths. **(2 Lectures)**
6. **Physical design automation of embedded systems (from the perspective of custom single purpose processors for embedded systems):** Partitioning, floor-planning, placement, routing; clock design considerations, timing margins, clock skew, clock distribution networks. **(3 Lectures)**
7. **Dynamically reconfigurable Embedded Systems:** Static versus dynamic reconfiguration of embedded systems, full versus partial reconfiguration, voltage scaling and power management issues in dynamic reconfiguration. **(3 Lectures)**
8. **Introduction to Microcontrollers:** Introduction to microcontrollers, overview of architecture of a typical microcontroller such as AVR microcontroller, addressing, assembly language programming. **(4 Lectures)**
9. **Memory interfacing:** Memory technologies – SRAM, DRAM and ROM, different types of DRAM architectures – 2D RAM, FPMDRAM, EDODRAM, SDRAM, RDRAM, DDRAM, DDR2RAM, etc, different types of ROM- PROM, EPROM, EEPROM, memory interfacing circuits, single cycle versus multiple cycle interfacing, timing diagrams, etc. **(3 Lectures)**
10. **Interfacing with I/O devices:** Port and bus based I/O, Memory mapped and I/O mapped I/O, register and tristate buffer based I/O interfacing, arbitration methods – priority, daisy chain and network oriented arbitration methods, serial protocols – SPI and I2C. **(4 Lectures)**
11. **Timers and Counters:** Timer/counter programming, notion of watch dog timers and real time clocks. **(2 Lectures)**
12. **Interrupt processing:** Introduction to interrupts, external versus internal interrupts, software versus hardware interrupts, synchronous versus asynchronous interrupts, single interrupt versus multiple interrupt systems, prioritization of interrupts, inversion of interrupt priorities, inheritance of interrupt priorities and associated protocols. **(4 Lectures)**
13. **Real world interfacing of microcontrollers:** Interfacing with simple devices such as LCD, keyboard, motor control, sensors, LED 7 segment display, DTMF decoder, etc. **(2 Lectures)**
14. **Hardware Software Codesign:** Notion of hardware software partitioning, graph based and pareto optimal approaches to hardware software partitioning, resource and timing constrained hardware software partitioning. **(3 Lectures)**



15. Internet of Things (IoT): Overview of Internet of Things, IoT architecture, Communication protocols, Notion of internet of everything. **(1 Lecture)**

Laboratory Experiments: Laboratory exercises based on timers and counters, interrupts, serial peripheral interface, inter-integrated circuit, hardware description language based hardware modeling of embedded cores, hybrid embedded processors, FPGA implementation of embedded processor architectures.

3. Text Books:

1. F. Vahid and T. Givargis, "Embedded Systems: A Unified Hardware Software Introduction", John Wiley and Sons, 2011.

4. References:

1. G. Nicholescu and P.J. Mosterman, "Model based design of Embedded Systems", CRC Press, 2009.
2. Dhananjay Gadre, "Programming and Customizing the AVR microcontroller", Tata McGraw Hill, 2014.
3. Wayne Wolf, "FPGA based Systems Design", Pearson Education, 2003.
4. Volnei A. Pedroni, "Circuit Design with VHDL", The MIT Press, 2004.
5. Steve Kilts, "Advanced FPGA Design: Architecture, Implementation and Optimization", J. Wiley and Sons, 2007.
6. Seetharaman Ramachandran, "Digital VLSI Systems Design", Springer Verlag, 2012.
7. Peter J. Ashenden, "The designer's guide top VHDL", Morgan Kaufmann, 2008.
8. Charles H. Roth Jr., "Digital Systems Design using VHDL", Cengage Learning, 2014.

5. Similarity Content Declaration with Existing Courses:

S.N.	Course Code	Similarity Content	Approx. % of Content
1.	EE208P	Hardware Description Languages, Introduction to FPGA, Introduction to Microcontrollers (Total 10L)	25%

6. Justification for new course proposal if cumulative similarity content is > 30%:N/A

Approvals:

Other Faculty interested in teaching this course: Dr. Rahul Shrestha, Dr. Srikant Srinivasan

Proposed by: Dr. Shubhajit Roy Chowdhury

School: SCEE

Signature: _____

Date: _____

Recommended/Not Recommended, with Comments:

Chairman, CPC

Date: _____

Approved/Not Approved

Chairman, Senate

Date: _____

Note:

The course has been discussed in CIG and modified as per their suggestion.



IIT Mandi Proposal for a New Course

Course Number : Project (Part-1)

Course Name : MA-591

Credits : 0-0-20-10

Prerequisites : None

Intended for : M.Sc. in Applied Mathematics (3rd Semester)

Distribution : Core

Semester : Odd

Preamble:

This is a compulsory project component of the M.Sc. in applied Mathematics programme. This is the first part of the two-semester (third and fourth) project for the second year students in M.Sc. in applied Mathematics programme. Under this course students will learn how to do scientific research. They will develop the presentation skill, and scientific research ability, report writing, etc. Faculty Supervisor will be assigned against each student, who will help and observe the research progress of the student. Proper evaluation process will be followed to judge the performance of individual students.

Course Modules: NA

- Three-member committee will be constituted for each student including Guide, Program Coordinator and one Subject expert. If Program Coordinator is the guide, then Faculty Adviser of that batch will be in the committee.
- Two presentations will be conducted, one in the middle of the semester and other one at the end of the semester.

Text book: NA

References: NA

Approvals:

Other Faculty interested in teaching this course: All CIG members of "M.Sc. in Applied Mathematics Programme"

Proposed by: Rajendra Kr. Ray School: SBS

Signature: _____ **Date:** 15.09.2017

Recommended/Not Recommended, with Comments:

_____ **Date:** _____

Chairman, CPC

Approved / Not Approved

_____ **Date:** _____

Chairman, Senate



IIT Mandi
Proposal for a New Course

Course Number : Project (Part-2)
Course Name : MA-592
Credits : 0-0-28-14
Prerequisites : None
Intended for : M.Sc. in Applied Mathematics (4th Semester)
Distribution : Core
Semester : Even

Preamble:

This is a compulsory project component of the M.Sc. in applied Mathematics programme. This is the second part of the two-semester (third and fourth) project for the second year students in M.Sc. in applied Mathematics programme. Under this course students will learn how to do scientific research. They will develop the presentation skill, and scientific research ability, report writing, etc. Faculty Supervisor assigned during 3rd semester will continue with the same student, and will help and observe the research progress of the student. Proper evaluation process will be followed to judge the performance of individual students.

Course Modules: NA

- Three-member committee will be constituted for each student including Guide, Program Coordinator and one Subject expert. If Program Coordinator is the guide, then Faculty Adviser of that batch will be in the committee.
- Two presentations will be conducted, one in the middle of the semester and other one at the end of the semester.

Text book: NA

References: NA

Approvals:

Other Faculty interested in teaching this course: All CIG members of "M.Sc. in Applied Mathematics Programme"

Proposed by: Rajendra Kr. Ray School: SBS

Signature: _____ **Date:** 15.09.2017
Recommended/Not Recommended, with Comments:

Chairman, CPC
Approved / Not Approved

Date: _____
Chairman, Senate



Proposal for a New Course

Course Number : CY660
Course Name : Photocatalysis: Fundamentals and Applications
Credits : 3-0-0-3
Prerequisites : CY506 and CY507 or equivalent/ Consent of instructor
Intended for : M.Sc. (Chemistry) and Ph.D.
Distribution : Elective (PG and Ph.D.)
Semester : Odd/ Even

1. Preamble:

Photocatalysis is currently an active and constantly growing research area having applications in wide ranging fields from environmental remediation to energy generation. Several novel and advanced catalysts have been developed recently to utilize the naturally abundant sunlight to perform important photochemical reactions. With the recent advancements in the investigation techniques, it is now possible to thoroughly characterize the photocatalysts and the involved processes, leading to novel and innovative strategies for the development of highly efficient photocatalysts. Keeping these in mind, this course has been designed to provide the students with a fundamental knowledge of photocatalysis, photochemical processes, materials used and their characterization, in addition to giving a detailed overview of the different technological applications of photocatalysis.

2. Course Modules with Quantitative lecture hours:

Module 1: Fundamental Concepts

08 hours

Photocatalyst – introduction; light-matter interactions; semiconductor physics; quantum size effects; photoelectrochemistry and redox potentials; type I & II Semiconductors; Z-scheme photocatalytic systems

Module 2: Photochemical Processes

08 hours



Primary processes (homogeneous and heterogeneous) and time scales; natural photosynthesis (PSI & PSII); kinetics and reaction mechanisms; quantum yield and quantum efficiency; photonic yield and photonic efficiency; solar energy conversion efficiency; reactor design; reaction engineering

Module 3: Advanced Photocatalysts

10 hours

Selection of materials; band energy diagrams, band gap and band bending; pure and doped photocatalysts; composite and heterojunction photocatalysts; organic photocatalysts; dye-sensitized photocatalysts; strategies for development of efficient photocatalysts; review of current research

Module 4: Investigation Techniques

06 hours

X-ray diffraction; x-ray photoelectron spectroscopy; x-ray absorption spectroscopy; surface area measurements (BET analysis); photophysical measurements (UV-vis spectroscopy, Kubekka Munk function for band gap determination, diffuse reflectance spectroscopy, fluorescence spectroscopy); Raman spectroscopy

Module 5: Technological Applications

10 hours

Degradation of organic contaminants in water; removal of metallic and inorganic pollutants; inactivation of microorganisms; artificial photosynthesis (water splitting and carbondioxide reduction); organic transformations; biomass conversion; review of current research

3. Text books:

- [1] Y. Nosaka, A. Nosaka, *Introduction to Photocatalysis: From Basic Science to Applications*, RSC (2016).
- [2] R. Ameta, S. C. Ameta, *Photocatalysis: Principles and Applications*, CRC Press (2016).

4. References:

- [1] J. Schneider, D. Bahnemann, J. Ye, G. L. Puma, D. D. Dionysiou (Eds.), *Photocatalysis: Fundamentals and Perspectives*, RSC Energy and Environment Series (2016).
- [2] D. Dionysiou, G. L. Puma, J. Ye, J. Schneider, D. Bahnemann (Eds.), *Photocatalysis: Applications*, RSC Energy and Environment Series (2016).

5. Similarity Content Declaration with Existing Courses: None/ Not applicable

6. Justification for new course proposal if cumulative similarity content is > 30%: Not applicable

Approvals:

Other Faculty Members interested in teaching this course:

Proposed by: Dr. Venkata Krishnan School: School of Basic Sciences

Signature _____ Date _____

Recommended/Not Recommended, with Comments:

_____ Date: _____

Chairman, CPC

Approved / Not Approved

_____ Date: _____

Chairman, Senate

Response to BoA's comments on CY660 (Photocatalysis: Fundamentals and Applications)

Answers to comments of 17th BoA

Comment 1

The content is too large for a single course.

Answer 1:

The content of the course has been reduced as per the suggestion. Specifically, the following contents were removed from the syllabus to reduce the overall syllabus. This change will not affect the course structure or continuity between the other contents.

Module 1: Fundamental Concepts – no change



Module 2: Photochemical Processes – activity, selectivity and specificity

Module 3: Advanced Photocatalysts – no change

Module 4: Investigation Techniques – scanning electron microscopy; transmission electron microscopy; atomic force microscopy; electron paramagnetic resonance spectroscopy (EPR); electrochemical impedance spectroscopy; Mott-Schottky plot; theoretical modelling and computer simulations

Module 5: Technological Applications – purification and disinfection of air; medical applications

The number of lecture hours has also been correspondingly modified.

Comment 2

Prerequisite is somehow misleading. Especially why IC130, which is very basic level course for B. Tech. Also prerequisite and intended for doesn't match. Some 500 level course will be in prerequisite.

Answer 2:

The information on prerequisite has been modified according to the suggestions of BoA and the updated description is given below.

Course Number : CY660

Course Name : Photocatalysis: Fundamentals and Applications

Credits : 3-0-0-3

Prerequisites : CY506 and CY507 or equivalent/ Consent of instructor

Intended for : M.Sc. (Chemistry) and Ph.D.

Distribution : Elective (PG and Ph.D.)

Semester : Odd/ Even