

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



MINUTES OF 19TH BOARD OF ACADEMICS MEETING

VENUE : A-4 CONFERENCE ROOM, KAMAND)
DATE : 16TH NOVEMBER, 2017 (THURSDAY)
TIME : 03:00 P.M.

Following members attended the meeting

Sl.No.		Name	
1.	Dean Academics	Prof. B.D. Chaudhary	Chairman
2.	Associate Dean (Research)	Dr. Venkata Krishnan	Member
3.	Associate Dean (Courses)	Dr. Pradeep Parameswaran	Member
4.	Chairman Library Advisory Committee	Dr. Astrid Kiehn	Member
5.	Chairman Course Proposal Committee + Course Coordinator M.Sc. (Chemistry)	Dr. Chayan K Nandi	Member
6.	Course Coordinator (IC Courses)	Dr. Aniruddha Chakraborty	Member
7.	Course Coordinator (SHSS Courses) + Nominee (SHSS)	Dr. Shyamasree Dasgupta	Member
8.	Course Coordinator (B.Tech.-CSE)	Dr. Dileep A D	Member
9.	Course Coordinator (B.Tech.-EE)	Dr. Subashish Datta	Member
10.	Course Coordinator (B.Tech.-ME)	Dr. Arpan Gupta	Member
11.	Course Coordinator (B.Tech.-CE)	Dr. Deepak Swami	Member
12.	Course Coordinator (M.Tech.- (Energy Engg. (Materials))	Dr. Atul Dhar	Member
13.	Course Coordinator (M.Tech.- (Mechanical Engg. (Energy Systems))		Member
14.	Course Coordinator (M.Tech.- (VLSI))	Dr. Satinder Sharma	Member
15.	Course Coordinator (M.Tech.- (Communication and Signal Processing))	Dr. Renu M Rameshan	Member
16.	Course Coordinator (M.Tech.- (Power Electronics and Drives))	Dr. Narsa Reddy Tummuru	Member
17.	Course Coordinator (M.Tech.-Biotechnology)	Dr. Shyam K Masakpalli	Member
18.	Course Coordinator (M.Sc.-Applied Maths)	Dr. Nitu Kumari	Member
19.	Course Coordinator (M.Sc.-Physics)	Dr. Chander Shekhar Yadav	Member
20.	Course Coordinator (I-Ph.D.(Physics))	Dr. Hari Varma	Member
21.	Nominee-1: School of Engineering	Dr. Rajesh Ghosh	Member
22.	Nominee-2: School of Engineering	Dr. Venkata Uday Kala	Member
23.	Nominee-1: School of Computing & Electrical Engineering	Dr. Kunal Ghosh	Member

24.	Nominee-2: School of Computing & Electrical Engineering	Dr. Aditya Nigam	Member
25.	Nominee-1: School of Basic Sciences	Dr. Syed Abbas	Member
26.	Nominee-2: School of Basic Sciences	Dr. Prosenjit Mondal	Member
27.	Academic Affairs Secretary	Mr. J Raghunath	Member
28.	Research Affairs Secretary	Ms. Manushree	Member
29.	Assistant Registrar (Academics): Secretary	Mr. Suresh Rohilla	Secretary

Following members could not attend the meeting

1.	Nominee-1: School of Humanities & Social Sciences	Dr. Ashok Kumar	Member
2.	Industry Member - I	Dr. Nadeem Akhtar	Member

Special Invitee

1.	Dr. Sandip Saha	Asst. Prof., SE
2.	Dr. Mahesh Reddy	Asst. Prof., SE
3.	Dr. Mousumi Mukherjee	Asst. Prof., SE
4.	Dr. Sriram Kailasam	Asso. Prof., SCEE
5.	Dr. Srikant Srinivasan	Asst. Prof., SCEE
6.	Dr. Shail Shankar	Asst. Prof., SHSS
7.	Dr. Devika Sethi	Asst. Prof., SHSS
8.	Dr. Rajeshwari Dutt	Asst. Prof., SHSS



PART-A

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

19.1 To deliberate new courses to be offered in forthcoming semester (Feb-Jun 2018) which are not already approved by the Senate:

The Chairperson, CPC presented 15 new courses for consideration and approval of BoA. The following 15 courses were approved by the BoA for recommendation to the Senate. The final course descriptions after incorporating the suggested changes are placed at Annexure-“A”:

Sl. No.	Course No.	Course Title	Credits L-T-P-C	Proposed by	School
1	CE 402	Geotechnical Engineering II	2-1-0-3	Dr K V Uday	CE
2	CE 509	Bridge Engineering	3-0-0-3	Dr. Sandip Kumar Saha	CE
3	CE 511	Structural Dynamics with Application to Earthquake Engineering	3-0-0-3	Dr. Sandip Kumar Saha	CE
4	CE 554	Prestressed Concrete Structures	3-0-0-3	Dr. Rajneesh Sharma	CE
5	CE 605	Engineering Seismology and Seismic Hazard Assessment	3-0-0-3	Dr.MaheshreddyGade	CE
6	CE 606	Constitutive Modeling of Frictional Material	3-0-0-3	Dr.Mousumi Mukherjee	CE
7	CS 541P	IoT systems and Cloud	3-0-2-4 1-0-3-3	Dr.SrikantSrinivasan and Dr.SriramKailasam	CSEE
8	CY670	Fluorescence spectroscopy, microscopy and applications	3-0-0-3	Dr.Chayan K Nandi	SBS
9	EE 530	Optimization theory	3-0-0-3	Dr.RenuRameshan and Dr. Samar Agnihotri	CSEE
10	EE 532P	Supervised Research Exposure	0-0-4-2	Dr.RenuRameshan	CSEE
11	EE 623P	Practicum on Digital Control of Electric Drives	1-0-3-3	Dr.Narsa Reddy	SCEE
12	EE531	Estimation and Detection Theory	3-0-0-3	Dr. Samar Agnihotri	SCEE
13	HS 252	Introduction to Psychology	3-0-0-3	Dr.Shail Shankar	HSS
14	HS550P	Statistical Methods (Practical)	0-0-2-1	Dr. Shyamasree Dasgupta	HSS
15	ME 355	Internal Combustion Engines	3-0-0-3	Dr.AtulDhar	ME



19.2 Policy guidelines for M.S./Ph.D. admissions

The Board of Academics deliberated on the draft presented by AD (Research) on the policy guidelines for M.S./Ph.D. admissions. The Board decided to constitute a committee consisting of the following members to come up with a revised guideline addressing the concerns of the members of the Board.

Dr. Dileep A.D. – Chairperson
Dr. Neetu Kumari – Member
Dr. Uday Kala V – Member
Dr. Shyamasree Dasgupta – Member
Dr. Venkat Krishnan – Member

19.3 To deliberate on Interactive Socio-Technical Practicum (ISTP):

Some issues regarding ISTP course were presented in BoA by the current ISTP course coordinator. These include the issues related to the synchronization of schedules of IIT Mandi and WPI, ensuring parity of work, ensuring deliverable, maintaining faculty interest in mentorship, declining number of project proposals etc. It was brought to the notice of BoA that only 10 project proposals had been received for ISTP this year. Considering the schedule synchronization issues, the ISTP coordinator had proposed an early drop deadline for ISTP, which BoA had agreed upon. However, the BoA had not agreed to put a cap on the total number of students who can ops ISTP.

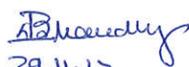
The BoA decided to constitute a committee of the following members to suggest ways and means to motivate faculty members to take up the role of mentorship in ISTP course, to increase geographical reach of the projects, and to make ISTP project outputs as inputs for entrepreneur projects.

Dr. Atul Dhar - Chairperson
Dr. Deepak - Member
Dr. Shyamasree Dasgupta - Member

Dr. Devika Sethi will share the available details with the Sub-committee and assist to prepare a suggestive report on ISTP to be presented in BoA.

The meeting ended with a vote of thanks to the Chair.


Secretary, Board of Academics


29.11.17

Chairman, Board of Academics

IIT Mandi

Proposal for a New course

Course Number: CE 402

Course Name: Geotechnical Engineering II

Credits: 2-1-0-3

Prerequisites: CE 302: Geotechnical Engineering – I or equivalent

Intended for: B.Tech 3rd or 4th year

Distribution: Discipline Elective

Semester: Odd/Even

1. Preamble: Any civil engineering structure needs a proper foundation to stand. This course provides an understanding to the student about the tests for ascertaining the strength in soil and later introduces the concepts for designing the foundation for the given soil and ambient conditions. The course also highlights the criteria for selecting shallow and deep foundations.

2. Modules:

- 1. Subsoil Exploration:** Methods of subsoil exploration Direct, semi direct and indirect methods, Soundings by Standard, Dynamic cone and static cone penetration tests, Types of Boring, Types of samples, Criteria for undisturbed samples, Transport and preservation of samples, Borelogs, planning of exploration programmes, report writing.
(8 contact hours)
- 2. Earth Pressure:** Types of Earth pressure. Rankines and Coulomb's Active and passive earth pressure in soils, concepts for slope stability and soil retaining wall design
(6 contact hours)
- 3. Bearing Capacity:** Safe bearing capacity and allowable bearing pressure, General and local shear failure conditions, Terzaghi's bearing capacity equations its modifications for square, rectangular and circular foundation, Factors affecting bearing capacity of Soil
(6 contact hours)
- 4. Design of Shallow Foundations:** Factors effecting locations of foundation and design considerations of shallow foundations, choice of type of foundations, Foundations on expansive soils.
(6 contact hours)
- 5. Settlement analysis:** Causes of settlement, Computation of settlement, immediate and consolidation settlement, allowable settlements, Measures to reduce settlement.
(4 contact hours)



6. **Pile Foundations:** Types, Construction, load carrying capacity of single pile – Dynamic Formula, Static formula, Pile load tests, Load carrying capacity of pile groups, settlement of pile groups, Negative skin friction.

(12 contact hours)

Text books:

- a) Braja M. Das, 'Principles of Foundation Engineering', Cengage Learning, 2015.
- b) V.N.S. Murty, 'Geotechnical Engineering', Book World Enterprises, 2008.

Reference books:

- a) W.C Teng, 'Foundation Design', Prentice Hall Publishers, 1962.
- b) J. E. Bowles, 'Foundation Analysis and Design', TataMc-Graw Hill Publishers, 1997.
- c) Shamsheer Prakash, Gopal Ranjan and Swami Saran, 'Analysis, Design of foundations and Earth retaining structures', IBH Publishers, 1979.

5. Similarity Content Declaration with Existing Courses:

S.No.	Course code	Similarity content	Appox. % of content
01	CE 302	Module 1-6	60%

6. Justification for new course proposal if cumulative similarity content is > 30%: The course 302 and earlier proposed IC course in Earth Science has been remodified. Since no decision was taken on IC course on Earth Science, hence it was decided in CIG- civil to restructure the contents. Hence, the content has been split to 2 courses, initial part in restructured CE 302 and remaining content shifted to present course.

Approvals:

Other Faculty interested in teaching this course: **Dr Mousumi Mukherjee**

Proposed by: **Dr K V Uday**

School: SE

Signature: _____ **Date:** _____

Recommended/Not Recommended, with Comments:

_____ **Date:** _____

Chairman, CPC

Approved / Not Approved

_____ **Date:** _____

Chairman, Senate

Indian Institute of Technology Mandi

Proposal for a New Course

Course Number : CE 509
Course Name : Bridge Engineering
Credits : 3-0-0-3
Prerequisites : Strength of Materials and Structures (CE301) or Equivalent, Design of Reinforced Concrete Structures (CE351) or Equivalent
Intended for : UG (3rd and 4th year), PG
Distribution : Discipline Elective (UG); Elective (PG)
Semester : Odd/Even

1. Preamble: Bridges are one of the lifeline structures in our society. Importance of bridges in hilly region is even more as many times they act as only access point to a whole region. This course is aimed to provide an eloquent discussion on the theoretical and practical considerations for design of bridges. The participants are expected to develop understandings of types of bridges, their functional requirements, and essential details for the analysis and design of different components. Through, course project on analysis and design of full scale bridge, and site visits (whenever feasible), the participants will be exposed to real life bridge design and construction practices.

2. Course Modules with Quantitative Lecture Hours:

Module 1: (4 lecture hours)
Introduction: Importance of bridges; Historical development and classification of bridge types; Various structural forms; Materials in bridge construction; Consideration for site selection; Determination of design discharge; Linear waterways and economical span; High flood level (HFL) and vertical clearance; Traffic projection.

Module 2: (3 lecture hours)
Design Loads: Consideration of various forces and their application as per IRC specifications for loadings on road bridges (IRC-6 2014).

Module 3: (8 lecture hours)
Structural Behavior and Concepts for Analysis: Moving load analysis; Grillage analogy; Structural behavior of box-girder bridges, arch bridges, suspension bridges, and cable stayed bridges.

Module 4: (17 lecture hours)
Design of Bridge Superstructure: Analysis and design of reinforced concrete slab bridge deck; Design considerations for skewed slab decks; Pre-tensioning and post-tensioning; Analysis and design of pre-stressed concrete slab deck; Introduction to T-beam bridges; Approximate methods for analysis of T-beam bridges: Courbon's method; Illustrative examples.



Module 5: (5 lecture hours)
Bridge Bearings and Joints: Importance and types of bearings; Design of elastomeric bearings; Seismic considerations for bearing design; Provisions for expansion joints.

Module 6: (3 lecture hours)
Bridge Substructure: Components of substructure; Computation of different forces acting on substructure; Introduction to various bridge foundation types.

Module 7: (2 lecture hours)
Construction and Maintenance: Common bridge construction techniques; overview of segmental construction for long span bridges; Primary functions of bridge maintenance; Categories of bridge inspections and instrumentation.

3. Text books:

- (i) D.J. Victor (2007), "Essentials of Bridge Engineering", 6th Edition, Oxford and IBH Publishing, New Delhi, India.
- (ii) N.K. Raju (2009), "Design of Bridges", 4th Edition, Oxford and IBH Publishing, New Delhi India.

4. Reference Books:

- (i) E.C. Hambly (1991), "Bridge Deck Behaviour", 2nd Edition CRC Press, Taylor and Francis Group, New York, USA.
- (ii) IRC-112 (2011), "Code of Practice for Concrete Road Bridges", Indian Roads Congress, New Delhi, India.
- (iii) IRC-6 (2014), "Standard Specifications and Code of Practice for Road Bridges, Section: II - Loads and Stresses", Indian Roads Congress, New Delhi, India.
- (iv) N. Rajagopalan (2013), "Bridge Superstructure", Narosa Publishing House, New Delhi, India.
- (v) S. Ponnuswamy (2007), "Bridge Engineering", 2nd Edition, Tata McGraw-Hill Education, New Delhi, India.
- (vi) V.K. Raina (2014), "Rainas Concrete Bridge Practice Analysis, Design & Economics", 4th Edition, Shroff Publishers and Distributors Pvt. Ltd., Mumbai, India.

5. Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1.	CE351	Fundamentals of Design of Reinforced Concrete Sections	5%

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

Not Applicable

Approvals:

Other faculty interested in teaching this course: Dr. Maheshreddy Gade, Dr. Kaustav Sarkar

Proposed by: Dr. Sandip Kumar Saha

School: School of Engineering (SE)

Signature: _____

Date: _____

Recommended / Not Recommended, with comments:

Chairman, CPC

Date: _____

Approved / Not Approved:

Chairman, Senate

Date: _____



Indian Institute of Technology Mandi Proposal for a New Course

Course Number : CE 511
Course Name : Structural Dynamics with Application to Earthquake Engineering
Credits : 3-0-0-3
Prerequisites : Strength of Materials and Structures (CE301) or Equivalent
Intended for : UG (3rd year and 4th year), PG
Distribution : Discipline Elective (UG); Core/Elective (PG)
Semester : Odd/Even

1. Preamble: As most of the civil engineering structures are subjected to natural or man-made time varying loading, it is important to have appreciation of dynamic behavior of such structures. To design a simple structure such as a concrete beam, a steel girder or a complex multi-story building or a more complex nuclear power plant against such time dependent loading, it is necessary to first analyze their dynamic responses. With increasing need of earthquake resistant design for better seismic safety, understanding of the dynamic behavior of structures is becoming inevitable for the structural designers. This course is aimed to develop an understanding of the dynamic characteristics and response of structural systems. The participants are expected to be able to apply the theories of structural dynamics for analyzing typical structures under earthquake loading.

2. Course Modules with Quantitative Lecture Hours:

Module 1: (3 lecture hours)
Introduction: Overview and importance of structural dynamics; Various types of dynamic loading; Mass excited and base excited systems; Degrees of freedom (DOF); Typical force-displacement behavior of structural-elements/-systems.

Module 2: (13 lecture hours)
Single Degree of Freedom (SDOF) Systems: Dynamic equilibrium equation for SDOF system; Analysis for undamped free vibration; Damping in structural system; Equation of motion and analysis for damped SDOF system; Critically-damped, over-damped and under-damped systems; Estimation of damping by logarithmic decrement method; Classical and non-classical damping; Equivalent viscous damping; Response of undamped and damped SDOF system to harmonic excitation, Half-power bandwidth method for damping evaluation; Response to support motion and force transmission to foundation; Response of SDOF system to periodic, impulsive, and general dynamic loading; Duhamel's integral.

Module 3: (10 lecture hours)
Multi Degrees of Freedom (MDOF) Systems: Idealization of multi-story shear building as MDOF system; Equations of motion for two-story shear building; Natural frequencies of vibration, modes and mode shapes of MDOF system; Orthogonality of modes; Normalization of modes; Classically damped system; Static condensation of DOF for a multi-story building; Dynamic analysis of linear two-DOF system; Dynamic response control of structures, tuned-mass damper.



Module 4: (4 lecture hours)

Systems with Distributed Properties: Vibration of uniform beam with various support conditions; Free vibration analyses; Natural frequencies of vibration and modes; Dynamic response to applied force and support excitation.

Module 5: (12 lecture hours)

Application to Earthquake Engineering: Equation of motion with earthquake excitation; Response quantities of interest and response histories; Response spectrum concept; Characteristics of acceleration, velocity and displacement response spectra; Elastic design spectra; Modal analysis of MDOF systems; Modal superposition method and mode combination rules; Response spectrum analysis of multi-story building; Introduction to response history analysis; Indian Standard code provisions for computation of and analysis for earthquake loading; Introduction to seismic control of structures; Dynamics of base-isolated structures.

3. Textbooks:

- (i) A.K. Chopra (2017), "Dynamics of Structures - Theory and Application to Earthquake Engineering", 5th Edition, Pearson, New Jersey, USA.
- (ii) J.L. Humar (2012), "Dynamics of Structures", 3rd Edition, CRC Press, Taylor and Francis, New York, USA.

4. Reference Books:

- (i) E.L. Wilson (2002), "Three-Dimensional Static and Dynamic Analysis of Structures", 3rd Edition, Computers and Structures, Inc., Berkeley, California, USA.
- (ii) M. Paz, Leigh W. (2006), "Structural Dynamics - Theory and Computation", 5th Edition, Springer Science+Business Media LLC, New York, USA.
- (iii) R.W. Clough, J. Penzien (1995), "Dynamics of Structures", 3rd Edition, Computers and Structures, Inc. Berkeley, USA.
- (iv) T.K. Datta (2010), "Seismic Analysis of Structures", 1st Edition, John Wiley & Sons (Asia) Pte Ltd, Singapore.
- (v) IS 1893 (Part 1) (2016), "Criteria for Earthquake Resistant Design of Structures: Part 1 General Provisions and Buildings", Bureau of Indian Standard, New Delhi, India.

5. Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	ME602	Mathematical foundation of vibration analysis for SDOF/MDOF systems and systems with distributed properties	25

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

Not Applicable

Approvals:

Other faculty interested in teaching this course: Dr. Maheshreddy Gade, Dr. Rajnish Sharma

Proposed by: Dr. Sandip Kumar Saha

School: School of Engineering (SE)

Signature:

Date:

Recommended / Not Recommended, with comments:

Chairman, CPC

Date: _____

Approved / Not Approved:

Chairman, Senate

Date: _____



Indian Institute of Technology Mandi

Proposal for a New Course

Course Number: CE-554
Course Name: Prestressed Concrete Structures
Credits: 3-0-0-3
Prerequisites: (i) Strength of Materials and Structures (CE301 or equivalent), (ii) Design of Reinforced Concrete Structures (CE351 or equivalent)
Intended for: UG (4th year), PG
Distribution: Discipline Elective (UG) / Elective (PG)
Semester: Odd/Even

1. Preamble: The concept of the prestressing has many advantages over the conventional methods. The prestressed concrete components are far superior than the conventional reinforced concrete components provided a skilled workmanship is ensured. This course will help to develop the concepts of prestressing and design of prestressed concrete members for using them regular structural design. Apart from the conceptual development of the theory, the course will also brief the standard design procedures for prestressed concrete components as per the provisions of Indian Standard (IS 1343: 2012) to make the participants familiar with the industry design practices. Participants will be encouraged to develop computational tools (e.g. computer code, spreadsheets etc.) for analysis and design of typical prestressed concrete components.

2. Course Modules with Quantitative Lecture Hours:

Module 1: (3 lecture hours)
Introduction: History of development, material and basic concept of prestressing, System of prestressing, Need and types of prestressing, Codes and Standards.

Module 2: (6 lecture hours)
Analysis of prestressed members: Basic assumptions, Analysis procedure, Prestress line and internal resisting couple, Concept of load balancing, Stresses in tendons, De-bonding and draping of prestressing tendons, Camber of prestressed member, Indeterminate prestressed concrete structures, Circular prestressing.

Module 3: (3 lecture hours)
Losses of prestress: Nature of losses of prestress, Consideration of allowable losses in design.

Module 4: (6 lecture hours)
Deflection of prestressed concrete members: Importance of deflection control, Influencing factors, Short term and long term deflection, Deflection of cracked members.

Module 5: (7 lecture hours)
Prestressed concrete members under flexure, shear and torsion: Flexural failure and strength analysis, Strain compatibility, Shear and torsion in prestressed members.



Module 6: (3 lecture hours)
Stress transfer in pretensioned members, Anchorage zone stress in post-tension members, Bursting/ end-block stresses, Transmission and transfer lengths.

Module 7: (8 lecture hours)
Design of prestressed concrete section: Limit state design criteria for prestressed concrete members, Design of section for flexure, Design of section for axial tension, Design of section for compression, Design of section for shear and torsion, Design for bond and bearing.

Module 8: (6 lecture hours)
Design of members: Design of pretensioned and post-tensioned flexural member, Design of prestressed beam and slab, Partially prestressed member.

3. Text books:

- (i) N.K. Raju, (2012), "Prestressed Concrete", 5th Ed., McGraw Hill Education, New Delhi, India.
- (ii) P. Dayaratnam (2016) "Prestressed Concrete Structures", 5th Ed., Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India.

4. References:

- (i) Michael P. Collins and Denis Mitchell (1994), "Prestressed Concrete Structures", Prentice Hall, New Jersey, USA.
- (ii) N. Rajagopalan (2010), "Prestressed Concrete", 2nd Ed., Narosa Publishing House, New Delhi, India.
- (iii) T. Y. Lin, N. H. Burns (2010), "Design of Prestressed Concrete Structures", Indian Student Edition, 3rd Ed., Wiley India Private Limited, India.
- (iv) A. E. Naaman (2013) "Prestressed Concrete Analysis and Design – Fundamentals", Indian Ed., McGraw Hill Education, New Delhi, India.
- (v) E. G. Nawy (2005) "Prestressed Concrete - A Fundamental Approach", 5th Ed., Prentice Hall International, New Jersey, USA.
- (vi) IS 1343 (2012), "Prestressed Concrete - Code of Practice", Bureau of Indian Standards, New Delhi, India.

5. Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	NIL	-	-

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

Not Applicable.



Approvals:

Other faculty interested in teaching this course: Dr. Maheshreddy Gade, Dr. Kaustav Sarkar

Proposed by: Dr. Rajneesh Sharma and Dr. Sandip Saha School: School of Engineering (SE)

Signature:

Date:

Recommended / Not Recommended, with comments:

Chairman, CPC

Date:

Approved / Not Approved:

Chairman, Senate

Date:



IIT Mandi

Proposal for a New course

Course Number: CE 605
Course Name : Engineering Seismology and Seismic Hazard Assessment
Credits : 3-0-0-3
Prerequisites : Structural Dynamics with Application to Earthquake Engineering (CE 511) or equivalent course
Intended for : B.Tech. 4th year/ M.S./ M.Tech./ Ph.D.
Distribution : Discipline Elective (UG, 4th year); Discipline Elective (PG)
Semester : Odd/Even

1. Preamble: The goal earthquake – resistance design is to produce a structure or facility that can withstand a certain level of shaking without excessive damage. The level of shaking is described by a design ground motion and its parameters. Estimation of design ground parameters is one of the most difficult and challenging problem in Engineering Seismology. The main objective of this course is to teach basic principles of engineering seismology and different methods to estimate region specific ground motions and its parameters. This course also discusses about the uncertainties in size, location, and time of occurrence of earthquakes.

It is well known that Himalayan region is one of the seismically active region in the world. This region has experienced many large earthquakes in past and has the potential to produce many more in future. This course emphasis on seismic activity and hazard assessment of the Himalayan region.

2. Course Modules with Quantitative Lecture Hours:

Module 1: Introduction (5 contact hours)
Internal Structure of the Earth; Plate tectonics and boundaries; Faults; Focal mechanisms; Location of Earthquakes; Size of Earthquakes; Major Earthquakes in the world; Important Indian Earthquakes.

Module 2: Wave Propagation in Elastic Medium (11 contact hours)
Waves in Infinite Medium; longitudinal and Shear waves; Waves in Semi – infinite medium; Reflection and refraction of waves; Rayleigh waves and Love waves; Response of an elastic Half – Space due to surface and buried forces. Seismic moment tensor. Time dependence.

Module 3: Strong Ground Motion and Parameters (12 contact hours)
Strong – Motion measurement; International and Local strong motion networks; Synthetic strong ground motions; Stochastic seismological models; Empirical Green's

Function method; One - Dimensional Ground response analysis; Ground motion parameters.

Module 4: Seismic Hazard Analysis (14 contact hours)

Definitions- seismic hazard, disaster and risk; Deterministic seismic hazard analysis; Probability; Earthquake occurrence models; Estimation of maximum magnitude, maximum credible earthquake, design basis earthquake; Ground motion prediction equations; Return periods and strong motion exceedance rates; seismic Hazard curves; Deaggregation. Seismic microzonation, Case studies/Project on estimating the seismic hazard of important Himalayan Cities.

3. Text books:

- (i) S. L. Kramer (2004), "Geotechnical Earthquake Engineering", 2nd Edition, Person Education, Inc.
- (ii) K. F. Graff (1991), "Wave Motion in Elastic Solids", Dover Publications, Inc.

4. References

- (i) D. M. Boore (2003), "Simulation of Ground Motion Using the Stochastic Method", *Pure and Applied Geophysics*, 160, 635 - 676.
- (ii) Keiiti AKI and Paul G Richards (2002). "Quantitative Seismology", 2nd Edition, University Science Books, U.S.A.
- (iii) A. Udias (1999), "Principles of Seismology", 1st Edition, Cambridge University Press.
- (iv) NDMA (2011), Development of probabilistic seismic hazard map of India, Technical Report, Working Committee of Experts (WCE), National Disaster Management Authority (NDMA), New Delhi, India.
- (v) NPTEL course on "Geotechnical Earthquake Engineering" (online resources).

5. Similarity content declaration with existing courses:

S. N.	Course Code	Similarity Content	Approximate % of Content
NIL	Not Applicable	Not Applicable	Not Applicable

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

Not Applicable

Approvals:

Other Faculty interested in teaching this course: None

Proposed by: Dr. Maheshreddy Gade

School: School of Engineering (SE)

Signature: _____

Date:

Recommended / Not Recommended, with comments:

Date: _____

Chairman, CPC

Approved / Not Approved:

Date: _____

Chairman, Senate



IIT Mandi
Proposal for a New course (Revised)

Course Number: CE606

Course Name: Constitutive Modeling of Frictional Material

Credits: 3-0-0-3

Prerequisites: Geotechnical Engineering I (CE302) or Equivalent/ Mechanics of Solids (ME206) or Equivalent

Intended for: B.Tech. 4th year/ M.S./ M.Tech./ Ph.D.

Distribution: Open Elective

Semester: Odd/Even

1. Preamble:

Constitutive modeling of geomaterial plays a pivotal role in numerical analysis and design of complex geotechnical structures. The course aims to develop a basic understanding of various constitutive models pertinent to pressure-dependent/frictional materials, such as soils, rocks and concrete, with focus on their underlying assumptions and limitations. Further, it also involves hands on implementation of different constitutive models for geomaterials, which serves the main backbone of material response in any finite element computation of complex geotechnical structures. Starting with the basic concepts of continuum mechanics, the macroscopic response of geomaterials will be discussed in relation to the constitutive modeling. Different elastic and elasto-plastic modeling concepts will be explained along with due consideration to the model calibration and implementation procedure. The course will be concluded with discussions on advanced constitutive models which are relevant for mimicking material behavior under specific cases, for example, blasting, earthquake or unsaturated condition to name a few.

2. Course Modules with Quantitative Lecture Hours:

Module 1: Mathematical Background (6 lecture hours)

Overview and importance of constitutive modeling; Preliminaries on tensor; Stress, strain and invariants; Principal stress space: triaxial and octahedral plane; Stiffness tensor; Voigt notation.

Module 2: Constitutive Behavior of Geomaterials (3 lecture hours)

Different laboratory tests and various modeling aspects pertinent to the stress-strain behaviour of geomaterials subjected to shearing and volumetric compression, e.g., void ratio, pressure and stress path dependency, anisotropy and rate/time effects etc.



Module 3: Elasticity (6 lecture hours)

Linear, nonlinear and anisotropic elastic models; Calibration of model parameters.

Module 4: Plasticity (7 lecture hours)

Internal variable, yield criteria, flow rule, plastic potential, Drucker's stability postulate, convexity and normality rules, hardening/ softening, isotropic and kinematic hardening; Different failure criteria for yielding: Tresca, von Mises, Mohr-Coulomb, Drucker-Prager, Hoek and Brown etc.

Module 5: Critical State Models (6 lecture hours)

Critical state concept; Stress-dilatancy theory; Strain hardening and/or work hardening plasticity models for sand: formulation, calibration and implementation to simulate drained and undrained triaxial test.

Module 6: Cam-Clay Models (10 lecture hours)

Cam-Clay models: formulation and calibration; Implementation of Cam-Clay model to simulate single element tests: consolidation, drained and undrained triaxial test, Application of elasto-plastic models.

Module 7: Special topics (4 lecture hours)

Other advanced constitutive models for frictional materials (e.g., damage plasticity/ viscoplasticity/ unsaturated soil model/ disturbed state model etc.)

3. Text Book:

- (i) David Muir Wood, Soil Behaviour and Critical State Soil Mechanics, Cambridge University Press, 1991.
- (ii) Alexander Puzrin, Constitutive Modelling in Geomechanics, Springer, 2012.

4. References:

- (i) David Muir Wood, Geotechnical Modelling, CRC Press Taylor and Francis Group, 2004.
- (ii) W.F. Chen and E. Mizuno, Nonlinear analysis in soil mechanics: theory and implementation, Elsevier Science Ltd, 1990.
- (iii) Hai-Sui Yu, Plasticity and Geotechnics, Springer, 2006.
- (iv) W.F. Chen and G.Y. Baladi, Soil Plasticity: Theory and Implementation, Elsevier Science Ltd, 1985.
- (v) C.S. Desai, Mechanics of Materials and Interfaces: The Disturbed State Concept, CRC Press Taylor and Francis Group, 2000.
- (vi) N.S. Ottosen and M. Ristinmaa, The Mechanics of Constitutive Modeling, Elsevier Science, 2005.

- (vii) J.C. Simo and T.J.R. Hughes, Computational Inelasticity, Springer, 2000.
 (viii) E.A. de Souza Neto, D. Peric and D.R.J. Owen, Computational Methods for Plasticity: Theory and Applications, Wiley, 2008.
 (ix) Allan F. Bower, Applied Mechanics of Solids, CRC Press Taylor and Francis Group, 2009.

5. Similarity Content Declaration with Existing Courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	IC242	Tensor; Stress, strain and stiffness tensor; Invariants	<5%
2	ME206	Stress and strain definition; Theory of yielding	<3%
3	CE301	Concepts of stress and strain; Elastic constants and their relationships	<3%
4	CE302	Stress strain curve, Mohr-coulomb failure criteria, pore pressure, total and effective stress	<3%
5	ME607	Elastic deformation; The phenomenon of yield point and strain hardening.	<5%

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

Approvals:

Other faculty interested in teaching this course:

Proposed by: Dr. Mousumi Mukherjee

School: School of Engineering (SE)

Signature:

Date:

Recommended / Not Recommended, with comments:

 Chairman, CPC

Date:

Approved / Not Approved

 Chairman, Senate

Date:

Proposal for a New Course

Course Number	: CS541P
Course Name	: IoT systems and the Cloud
Credits	: 1-0-3-3 (L-T-P-C)
Prerequisites	: IC161 – Applied Electronics or equivalent IC250 – Programming and Data Structure Practicum or equivalent with Consent of Instructor
Intended for	: B.Tech. (EE. & CSE) /MS/MTech/PhD
Distribution	: Elective for B.Tech. III/IV year, MS, M.Tech., Ph.D.
Semester	: Even/Odd

1. Preamble:

Internet-of-Things is a rapidly expanding domain with applications in both the national and international context. This course is a cross disciplinary 'practicum' course intended to give the students a hands-on experience of end-to-end design and implementation of IoT-based systems. It covers issues related to data acquisition and practical deployment of IoT-based systems, connecting the sensors to the cloud, and analytics on the cloud. The first half of the course will provide hands-on experience to the students in interfacing sensors with common microcontrollers such as Arduino and Raspberry Pi, enabling device-to-device communications, real time data acquisition and hardware control through sensor networks, and connecting the physical systems to a cloud computing platform. The second half will provide hands-on-experience on using different types of storage platforms in the cloud like message queues, distributed file systems and databases, and different computing paradigms such as map reduce. It will also introduce concepts of complex event processing, few algorithms for mining data streams and lambda architecture for combining batch and real-time analytics. The course includes mini-projects and labs in addition to lectures to facilitate and encourage learning by doing.

2. Course Modules with Quantitative lecture hours:

Module 1: Hardware components of IoT systems: Introduction to microcontrollers including PIC, Arduino, Raspberry Pi; interfacing sensors and actuators with microcontrollers, building breadboard circuits, using IoT CAD tools; performance characteristics, drift, measurement techniques, packaging. [4 lecture hours + 12 lab hours]

Module 2: Networking of devices: Device-to-device communication; networking protocols and architectures; scheduling and routing; wired and wireless (Bluetooth, Zigbee, NFC) sensor networks; communication technologies like LoRA, SigFox, Cellular IoT; edge analytics and sensor control in networks. [3 lecture hours + 9 lab hours]

Module 3: Getting Data Ready for Analytics in the Cloud: Introduction to cloud service models, pre-processing input streams of IoT data, storage in the cloud – message queues, distributed file systems and distributed databases. [3 lecture hours + 9 lab hours]

Module 4: Data Analytics in the Cloud: Computing paradigms – map-reduce and its extensions to resilient distributed datasets, concepts in complex event processing (CEP), algorithms for mining data streams, Lambda Architecture. **[4 lecture hours + 12 lab hours]**

3. Text book:

- Donald Norris, "The Internet of Things", McGraw Hill Education, 2015.
- Nathan Marz and James Warren, "Big Data: Principles and best practices of scalable realtime data systems", Manning Publications, April 2015

4. Reference Books:

- Upton and Halfacree, "Raspberry Pi User Guide", Wiley, 2014.
- Robert Faludi, "Building Wireless Sensor Networks" O'Reilly Media, 2011.
- Jure Leskovec, Anand Rajaraman and Jeffrey D. Ullman, Mining of Massive Datasets, v2.1 on-line edition, 2015.
- Research papers on Resilient Distributed Datasets, Kafka, HBase, etc.

5. Similarity Content Declaration with Existing Courses:

S.N	Course Code	Similarity Content	Approx % of content
1	Design of Concurrent Software (CS546) Big Data and Map Reduce (CS561)	Map-reduce computing paradigm	10%
2	Embedded Systems (CS404)	Sensor control using Micro-controllers	20%

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

Approvals:

Other Faculty who may be interested in teaching this course: Dr. Siddhartha Sarma, Dr. Shubhajit Roy Chowdhury, Prof. Timothy A. Gonsalves

Proposed by: Dr. Srikant Srinivasan and Dr. Sriram Kailasam

School: SCEE

Signature: _____

Date: _____

Recommended/Not Recommended, with Comments:

_____ Date: _____
Chairman, CPC

Approved / Not Approved

_____ Date: _____
Chairman, Senate

Comments from CIG	Response to comments
<p>1) I would like to look at this course as a 3-0-2-4 course rather than a 1-1-2-3 course. This gives opportunity to the course teacher to deliberate on the concepts in details.</p> <p>2) I think we need more lectures for modules 1 and 2.</p> <p>3) Is tutorial really needed for this course?</p> <p>4) Some lectures on real time data acquisition and transmission would be quite effective.</p> <p>5) A course like EE529 (Embedded Systems) can be a good prerequisite for this course.</p>	<p>1) We wanted a cross disciplinary 'practicum' course that both CS and EE students can take. The course is designed to give them hands on experience rather than focus too much on theory.</p> <p>2,3) We have replaced the tutorial with more lab sessions.</p> <p>4,5) This course is more focused on providing hands-on-experience; so we intend to cover only the important aspects of theory. EE529 and some other courses would be good follow-on courses as they cover more theoretical aspects.</p>
<p>1) There is no module that deals with the communication aspects of IoT. Though the second module briefly mentions device-to-device communication, but I think this is not sufficient to cover the communication paradigm of IoT. From my perspective, IoT is more about communication and less about data analytics, micro-controller programming or performance tuning. I guess we need a dedicated module for the communication protocols and other relevant topics.</p> <p>2) How will you do the evaluation? Will it be a lab evaluation or a theory paper or mini projects or all of them? In my opinion, theoretical part should be kept as minimum as possible. The credit 1 (assigned to theory) says about the lecture hours but not about the evaluation pattern.</p> <p>3) Finally, the prerequisites should be relaxed. Most of our M.Tech. (CSP) students might not have gone through CDP, IC250P or equivalent courses. For them socket programming will be a completely new topic. Are you planning to provide additional tutorial sessions for them?</p> <p>In summary, I think we can offer a theory and a practicum course (2 credits each) rather than offering everything in a single package (which will be hard to digest :)).</p> <p>4) Here is a book which you may include in the Reference books: "Building Wireless Sensor Networks by Robert Faludi.</p>	<p>1) In module 2, we have incorporated the communication aspects of IoT.</p> <p>2) The evaluation is weekly labs and final project.</p> <p>3) We have removed CDP from the pre-requisite. We will cover the necessary background on networking/operating systems during the lab sessions. We want to encourage both EE and CSE to get an overview of end-to-end design and implementation of IoT based system. So we do not want to split the course.</p> <p>4) Yes we have included the book you mentioned among the reference books.</p>

<p>Copyright 2011 Robert Faludi, 978-0-596-80773-3.”</p> <p>This book is a practical guide to ZigBee mesh networking protocol.</p>	
<p>1) As a practicum course, students would be spending most of their time on building a working system. There appears to be substantial overlap with 4th semester DP done by some groups. Have to make sure that students go to greater depth and breadth.</p> <p>2) Generally, tutorials as part of the syllabus are only for 1st and 2nd BTech. Older students are expected to be more mature, able to work out problems without having a TA/teacher watching over them. :-) So, make it 1-0-3-3 or whatever.</p> <p>3) I suggest reducing lectures and increasing lab time (actually spent in the lab with teacher/TAs). The lectures can focus on a few concepts rather than the details of many products, programming systems, cloud platforms, etc.</p> <p>4) Prereqs: It is fine to specify them. Any student who has done the prereqs cannot be prevented from registering (unless there is a numerical cap). By default, the instructor is free to accept other students with "equivalent". The statement "CS546 ... are not offered" is not correct.</p> <p>5) A general comment: for many BTech students, having greater breadth is good. For the better BTech students and for PG students, they should be encouraged to go in depth in one area by a graduated sequence of courses. With this as an intro course in IoT, what are the in-depth courses? CS546? others? Can we work out the sequence and publicise it?</p>	<p>1) We will ensure that the students who have worked on IoT part in DP will explore more on the cloud analytics part during the project.</p> <p>2) We have removed the tutorials and replaced it with more lab sessions. The course credit structure has been revised : 1-0-3-3</p> <p>3) We have revised module 3 and 4 to cover only the most important concepts in the theory; students will learn how to use the cloud platforms through the lab sessions.</p> <p>4) We have made relevant changes to the course proposal.</p> <p>5) Will be done. However, it is not within the scope of the course proposal.</p>
<p>1) The credit should be made 3-0-2-4. The content of Module 4 may be reduced and additional inputs may be provided in Module 1 & 2.</p> <p>2) I am very happy with the content specially with focus on Hands-on experience. Is CS309 required pre-requisite ? Too many prerequisite may limit the target audience.</p>	<p>1) We have removed CS309 from the pre-requisite. We will cover the necessary background on networking/operating systems during the lab sessions.</p> <p>2) Since we wanted a cross disciplinary 'practicum' course that both CS and EE students can take, we have designed the course to give them hands on experience rather than focus too much on theory. Hence the course credit has not been changed.</p>

IIT Mandi Proposal for a New Course

Course Number : CY 670
Course Name : Fluorescence spectroscopy, microscopy and applications
Credits : 3-0-0-3
Prerequisites : NA
Intended for : MSc / M. Tech / PhD in Chemistry, Physics, nanotechnology and other discipline relevant to the course content
Distribution : Elective
Semester : Odd/Even

1. **Preamble:** The main focus of this course is to provide deeper understanding on fundamentals of fluorescence spectroscopy, microscopy and its application in chemical sciences, physical sciences, life sciences and material sciences. The designed course will be extremely helpful for the students, who designed new molecules, materials for the real application.

2. Course Modules with Quantitative lecture hours:

Module 1: Introduction to fluorescence spectroscopy: (12)

Light matter interaction, different processes when light absorbed by matter, light scattering, Fluorescence, Phosphorescence, absorption, Transition moments and transition probabilities, Einstein's coefficients, oscillator strength, Beer-Lambert law, polarizabilities, Frank Condon Principles. Steady state fluorescence, Jablonski diagram describing the excited processes, characteristics of fluorescence spectra, Kasha and Vavilov's rule, Stokes shift, radiative and nonradiative processes, overview of time and frequency domain measurement, fluorescence lifetime or decay, quantum yield and calculation, time correlated single photon counting (TCSPC), light source and electronics for TCSPC, Instrumentation of steady state and time resolved spectrophotometer such as light source, detectors etc.

Module 2: Solvent and environment effects: (4)

Effect of solvent polarity on spectral shift, general solvent effect, The Lippart Mataga equation, specific solvent effect, temperature effect, additional factors affecting the spectral shift locally excited and internal charge transfer states, excited state intramolecular proton transfer, dynamics of solvent effect, time resolved emission spectra (TRES), picosecond spectral relaxation in solvent, theory for time dependent solvent relaxation, red edge excitation shift.

Module 3: Quenching of fluorescence (6)

Reasons of fluorescence quenching, type of quenching, static and dynamic quenching, Stern Volmer equation, theory of static quenching, mechanism of dynamic quenching, theory of combined quenching, photo-induced electron transfer based quenching, application of quenching in proteins, DNA dynamics, sensors, molecular beacons based quenching, effect of temperature, viscosity on the quenching,



Module 4: Fluorescence resonance Energy Transfer (FRET) (6)

Basics of energy transfer, donor acceptor pair, factors affecting the energy transfer, surface energy transfer (SET), difference between FRET and SET, comparison of quenching and FRET, distance dependent FRET, SET and quenching, metal enhanced fluorescence (MEF), mechanism of MEF, radiative decay engineering in MEF, surface plasmon coupled emission, energy transfer to multiple acceptors in one, two three dimensions.

Module 5: Fluorescence anisotropy (4)

Definition and theory of fluorescence anisotropy, relation of polarization to anisotropy, L and T format for anisotropy, effect of resonance energy transfer on anisotropy, effect of rotational diffusion on fluorescence anisotropy, time dependent anisotropy decay, rotational correlation time, applications of anisotropy on molecular interactions.

Module 6: Fluorescence microscopy and single molecule detection (10)

Basic principles and applications of wide field fluorescence microscopy, fluorescence lifetime imaging microscopy (FLIM), confocal microscopy, laser scanning TCSPC FLIM, single molecule detection (SMD), optical configuration of SMD, SMD detectors, single molecule based FRET, total internal reflection (TIRF), Fluorescence correlation spectroscopy (FCS), effect of concentration, diffusion coefficient, dual color fluorescence cross correlation (FCCS), applications of FCS and FCCS.

3. Text book:

1. Principles of fluorescence spectroscopy by Joseph R Lakowicz, 3rd edition, 2010 (springer).
2. Handbook of single molecule biophysics by Peter Hinterdorfer, Antoine Van Oijen, 2009 (Springer).

4. References:

1. Single Molecule Spectroscopy: Nobel Conference Lectures by R. Riglet, M. Orrit, T Basche, 1st edition 2012, (Springer Series in Chemical Physics)
2. Fluorescence Spectroscopy and Microscopy by Yves Engelborghs, Antonie Visser, 2014, (springer).
3. New Trends in Fluorescence Spectroscopy: Applications to Chemical and Life Sciences By M Valeur and J. C. Brochon 1st ed. 2001 (springer)
4. Fluorescence Applications in Biotechnology and Life Sciences by Ewa M. Goldys, 1st Edition, 2010(Wiley Blackwell)

5. Similarity Content Declaration with Existing Courses: NO

S.N.	Course Code	Similarity Content	Approx. % of Content
		NA	
		NA	

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

Approvals:

Other Faculty interested in teaching this course:

Proposed by: Dr. Chayan K Nandi

School: SBS

Signature: _____

Date:

Recommended/Not Recommended, with Comments:

Chairman, CPC

Date: _____

Approved / Not Approved

Chairman, Senate

Date: _____



Proposal for a New Course

Course Number : EE 530

Course Name : Optimization theory

Credits : 3-0-0-3 (L-T-P-C)

Prerequisites : Linear algebra (MA512 or IC 111) or Matrix Theory (EE522), instructor consent.

Intended for : UG /MS/MTech (CSP)/PhD/M.Sc(Maths)

Distribution : Core for Mtech (CSP), Elective for B.Tech. (EE. & CSE) III/IV year, MS, Ph.D, M.Sc(Maths).

Semester : Even

Preamble

This course is intended to be a core course for M.Tech Communication and Signal Processing students and elective for MS/Phd and senior B.Tech students. Many of the problems in communication as well as signal processing are solved using optimization. This course is intended to impart a strong mathematical background to the students so that they are in a position to (i) convert a given problem to an appropriate optimization problem (ii) analyze the problem and (iii) choose an appropriate algorithm to solve the problem.

Though the examples are selected from communication and signal processing, the course can benefit students from other areas of engineering/science since the theory covered is valid for all, irrespective of the application area.

Course modules with Quantitative lecture hours:

Math background: Vector spaces, sequences, limit and continuity. Matrix norms, eigenvalues, eigenvectors, symmetric and positive definite matrices. Coercive functions. Weierstrass theorem.

(5 lectures)

Convex analysis: convex sets, theorem of alternatives, convex cones, polyhedral sets, extreme points and directions. Convex functions, conjugate function, quasiconvex and pseudoconvex functions.

(7 lectures)

Linear programming: fundamental theorem of LP, simplex method, transportation and network flow problems, Interior-Point methods.

(7 lectures)

Unconstrained optimization: Necessary and sufficient conditions. Descent methods, convergence and rate of convergence.

(6 lectures)

Constrained optimization: tangent plane, eigenvalues in tangent space, cone of feasible directions and improving directions. Problems with equality and inequality constraints - Lagrangian function and the Lagrange multipliers, KKT conditions (necessary and sufficient).

(7 lectures)

Duality: Lagrangian dual problem, weak and strong duality theorems, properties of dual functions, getting the primal solution for convex, linear and quadratic programs.

(5 lectures)

Applications of convex programming, geometric programming, quadratic programming, second-order cone programming, and semi-definite relaxation to problems from communication and signal processing and other areas.

(5 lectures)

Textbook:

1. M.S. Bazaraa, H.D. Sherali and C.M. Shetty, Nonlinear Programming, 3/e, Wiley, 2006.

Reference books:

1. S. Boyd and L. Vandenberghe, Convex optimization, Cambridge University Press, 2008.
2. D. P. Bertsekas, Nonlinear programming, Athena Scientific, 1999.
3. D. G. Luenberger and Y. Ye, Linear and nonlinear programming, 3/e, Springer, 2008.

Similarity Content Declaration with Existing Courses:

Sr. No.	Course code and Title	Similarity content	Approx. % of content	Remarks
1	MA 651 Optimization Techniques	Convexity, simplex method, duality, unconstrained optimization algorithms	25%	MA 651 deals mostly with techniques and not the theory. The mentioned topics are covered in much more detail in the proposed course (more hours are spend for these topics).
2	EE 510 Mathematical Methods for Signal Processing	Unconstrained and constrained optimization.	20%	The topics are dealt with only at an introductory level.
3	MA 515 Applied Mathematical Programming	LP, simplex, nonlinear programming.	19%	MA515 is predominantly about solving linear programs, whereas the proposed course has LP as a small part. Hence the overlap.

Justification for new course proposal if cumulative similarity content is > 30%:

1. Since this is a core requirement for M.Tech (CSP) students, they need a single course which exposes them to the theory. They cannot be expected to take three courses to satisfy the requirement of a single area.
2. After discussing with the faculty members who are offering/have offered Optimization courses it was decided that EE 510 and MA 651 **will not be offered** any more. The three existing optimization courses will be stream lined so that the student can follow the path: Linear programming (MA515), Optimization theory (EE 531), and Heuristics in Optimization, which would deal mostly with techniques. This makes the overlap 19%.

Approvals:

Other faculty interested in teaching this course: Siddhartha Sarma, Samar Agnihotri, Satyajit Thakor, Manoj Thakur.

Proposed by: Renu Rameshan and Samar Agnihotri

School: SCEE

Signature:

Date: 28 October 2017

Recommended/Not Recommended, with comments

Chairperson, Course proposal committee (CPC)

Date:

Approved / Not Approved

Chairperson, Senate

Date:



Response to comments from CIG members

Comments	Response
<p>Optimization theory is very important course and it must be taught. However, I would like to remove few words in preamble that this course is intended to only signal processing and communication. Instead, it can be projected as several engineering problems</p>	<p>The primary purpose of introducing this course is as a core requirement for CSP students. Others are free to choose this course as an elective. Added a line to preamble to include this comment.</p>
<p>In last problems specific to communication and signal processing: Add some more disciplines. like finance...</p>	<p>This aspect of optimization is covered in the MA651 course.</p>
<p>You would like to add some programming assignments.</p>	<p>It is left to the instructor to include project/programming assignments.</p>
<p>The syllabus otherwise looks fine. Only I was feeling there should some connection established with domain areas such as signal processing and communication.</p>	<p>This is done in the last three modules, where the examples are chosen from the subject area. In addition the last module demonstrates how different types of formulations are used in problems specific to communication and signal processing.</p>
<p>Syllabus looks fine. It is well balanced. Since it is a core for the MTech CSP, dealing with some applications (or Case studies) of these techniques in connection with Communication and Signal Processing is preferable. Some application(s) can be mentioned at the end of each module.</p>	<p>Specific applications were not mentioned because there is a plethora of applications from which an instructor can choose according to his/her preferences.</p>

Proposal for a New Course

Course Number : EE 532P
Course Name : Supervised Research Exposure
Credits : 0-0-4-2 (L-T-P-C)
Prerequisites : None
Intended for : MTech (CSP)
Distribution : Core for Mtech (CSP)
Semester : Winter session of Year 1

Preamble

This is a compulsory project component in which the student works with a faculty member. These are individual projects and not to be done in a group. This is also meant to be an introduction to research/product development. The student works on a problem which can either be finished in two months time or it can be big enough to be continued as the final year project.

Course modules

By the end of first semester the students would have completed the following core courses: probability and random processes, advanced signal processing, advanced communication theory and matrix theory. Also one either of the following electives – speech signal processing/radiating systems/pattern recognition, is covered. So students can do any project in signal processing/communication area which requires any of the above subjects as a prerequisite.

Quantitative contact hours:

This is a **project**. The student is supposed to work around 40 hours a week for the project out of which there are 4 contact hours mentioned during which the student has to interact with the faculty.

Textbook: NA

Evaluation: Student needs to submit a report at the end of two months and grading will be based on two evaluations (Dec end and Jan end) by a panel of faculty members from the course interest group.

Approvals:

Other faculty interested in teaching this course: This is a project.

Proposed by: Renu Rameshan

School: SCEE

Signature:

Date: 1 November 2017

Recommended/Not Recommended, with comments

Chairperson, Course proposal committee (CPC)

Date:

Approved / Not Approved

Chairperson, Senate

Date:



IIT Mandi
Proposal for a New Course

Course Number: EE 623P

Course Name: Practicum on Digital Control of Electric Drives

Credits: 1-0-3-3

Prerequisites: Fundamentals of Electric Drives (EE508) and Practicum on Electric Drives (EE 508P)

Intended for: UG/PG

Distribution: Core for M.Tech. (PED), Elective for UG and other PG

Semester: Even (Feb-May)

1. **Preamble:** Practicum on Digital Control of Electric Drives is a lecture + laboratory course designed to provide the students with a hands-on experience of working with practical implementation of motor drive control using digital processors. This is a highly application-oriented course in which the prior knowledge of electrical machines and drives, control systems and microprocessors will be put to actual use. This course is very relevant and vital from the state-of-the-art drive control perspective.
2. **Course Modules with Quantitative lecture hours:** This is a lecture + laboratory course with 1-hour of classroom session accompanied by 3-hour laboratory sessions per week. Following is the list of course modules and experiments (numbered).
 - **Introduction to Microcontrollers and Digital Signal Processors (2+6 hours)**
Content: Review of microcontrollers and digital signal processors - numerical capabilities and peripheral units, Fixed and Floating point architectures, Real-time programming in assembly and C languages, Review of numerical methods for solving of ODEs
Laboratory: Numerical simulation of simple motor models (e.g. DC motors), use of look-up tables, study of numerical method errors and accuracy
 - **Digital simulation and implementation of machines and drives concepts (3+9 hours)**
Content: Reference frame transformation, PLL implementation, PWM implementation - including space vector PWM, machine models, harmonic and reactive power compensation,
Laboratory: A few lab sessions will be designed to practice the concepts taught above.
 - **Digital control of drives - simulation and implementation (7+21 hours)**
Content: Discrete time control of current, torque, flux, speed and position, cascade controllers, sensing and sampling of motor quantities, interfacing issues with digital processor, estimation of flux, torque and speed, digital implementation of FOC and DTC of induction motor, digital implementation of drive protection

Laboratory: Implementation of closed loop AC drive control using the concepts learned in this module. This session could be in the form of a course project, which can continue over multiple sessions.

- DSP based monitoring and diagnosis (2+6 hours)

Content: Introduction to fault diagnosis, early detection of fault, introduction to online condition monitoring, real-time FFT spectrum computation, introduction to parameter estimation algorithms

Laboratory: A couple of demo/experiment sessions focused on fault detection and diagnosis

3. Textbook

1. Krause, P. C., Wasynczuk, O., Sudhoff, S. D., Analysis of Electric Machinery and Drive Systems, New York, Wiley-Interscience, 2003.
2. Vas, P., Parameter estimation, condition monitoring, diagnosis of electrical machines, Oxford Science Publications, New York, 1993.

4. References:

1. W. Leonhard, Control of Electrical Drives, Springer-Verlag Berlin Heidelberg, 2001.
2. Vas, P., Sensorless vector and direct torque control, Oxford University Press, New York, 1998.

5. Similarity Content Declaration with Existing Courses: N/A

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

Approvals:

Other Faculty interested in teaching this course:

Proposed by: Dr Bhakti Joshi

Signature: _____

Recommended/Not Recommended, with Comments:

_____ Chairman, CPC

Approved / Not Approved

Chairman, Senate

School: SCEE Date:



Date: _____

Date: _____

A handwritten signature in blue ink, consisting of several loops and a final stroke extending to the right.

IIT Mandi
Proposal for a New Course

Course Number: EE 531

Course Name: Estimation and Detection Theory

Credits: 3-0-0-3 (L-T-P-C)

Prerequisites: EE304/ EE503/ EE305/ MA524 or equivalent, or instructor consent

Intended for: B.Tech./M.S./M.Tech./Ph.D.

Distribution: Core for M.Tech.(CSP), Elective for B.Tech. 3rd and 4th year, M.S., M.Tech(non-CSP), Ph.D.

Semester: Even/Odd

Preamble: Many problems in communication, statistical signal processing, and control involve processing of information signals corrupted by noise to make inferences about the information they contain. This course intends to provide fundamental theoretical ideas and techniques to develop and evaluate common frameworks to address myriad of such inferencing problems in communication, signal processing, and control.

Modules:

1. Mathematical background: (3 lectures)

Random variables and processes: vector spaces of random variables, CLT, stochastic processes, stationarity, spectral representation of stochastic processes, Wiener-Khinchin theorem, Gaussian process, white noise, stochastic processes through LTI systems.

Modeling of signals and noise: models, and selection of model and model order.

2. Ideal estimation for deterministic parameters: (6 lectures)

Principle of estimation and its applications, properties of estimators.

Minimum Variance Unbiased Estimation: existence and search of MVU estimators, sufficient statistics and its role in finding MVU estimator, extension to vector parameters, Neyman-Fisher factorization and Rao-Blackwell theorems.

Cramer-Rao Lower Bound: signals in white Gaussian noise, parameter transformation, vector parameters, general Gaussian case, and WSS Gaussian random processes, efficiency.

3. Practical estimation for deterministic parameters: (5 lectures)

Linear Models and Unbiased Estimators, scalar and vector Best Linear Unbiased Estimators (BLUE); Maximum Likelihood estimation, expectation-maximization (EM) algorithm; Least Squares estimation: linear, order-recursive, sequential, constrained, and non-linear.



4. Estimation for random parameters: (6 lectures)

Bayesian Estimation: Bayesian linear model, nuisance parameters, Bayesian estimation for deterministic parameters, risk functions, MMSE and MAP estimators, scalar, vector, and sequential Linear MMSE estimators, Wiener filtering.

Advanced topics: Levinson-Durbin and Innovation algorithms, graphical models, hidden Markov models.

5. Estimation beyond stationarity: (4 lectures)

Kalman filtering: State-space modeling, scalar, vector, and extended Kalman filters.

6. Statistical Detection Theory: (5 lectures)

Binary and multiple hypothesis testing, Neyman-Pearson theorem, receiver operating characteristics, minimum Bayes risk detectors, sequential detection, Composite hypothesis testing: Bayesian and generalized likelihood ratio test (GLRT), locally most powerful (LMP) detectors, asymptotically equivalent tests.

7. Detection of deterministic signals: (4 lectures)

Signals with known parameters: matched filter, linear model, multiple signal detection.

Signals with unknown parameters: signal modeling and detector performance, sinusoidal detection, linear models, energy detectors.

8. Detection of random signals: (5 lectures)

Signals with known parameters: Estimator-correlator, linear model, general Gaussian detection.

Signals with unknown parameters: incompletely known signal covariance, weak signal detection.

9. Detection with non-Gaussian and colored noise: (4 lectures)

Signals with known and unknown parameters, Karhunen–Loeve expansion and whitening filters.

Advanced topics: Complex and vector extensions of detectors: known deterministic signal in CWGN, spatially/temporally uncorrelated noise, random signal in CWGN.

Textbooks:

1. S. M. Kay, *Fundamentals of Statistical Signal Processing, Vol 1: Estimation Theory*, Prentice Hall, 1993.
2. S. M. Kay, *Fundamentals of Statistical Signal Processing, Vol 2: Detection Theory*, Prentice Hall, 1998.



Reference books:

1. L. L. Scharf, *Statistical Signal Processing: Detection, Estimation, and Time Series Analysis*, Addison-Wesley, 1991.
2. H. V. Poor, *An Introduction to Signal Detection and Estimation*, Springer-Verlag, 1994.
3. C. W. Helstrom, *Elements of Signal Detection and Estimation*, Prentice Hall, 1995.
4. G. Casella and R. L. Berger, *Statistical Inference*, Duxbury Press, 2002.
5. H. L. van Trees, K. L. Bell, and Z. Tian, *Detection, Estimation, and Modulation Theory, Part 1: Detection, Estimation, and Filtering Theory*, Wiley, 2013.

Similarity Content Declaration with Existing Courses:

Sr. No.	Course code and Title	Similarity content	Approx. % of content	Remarks
1	EE304: Communication Theory	MAP and ML detectors	< 10%	EE304 merely introduces these techniques while discussing optimum receiver design for various modulation schemes. However, the proposed course discusses these schemes in the general framework of Bayesian estimation.
2	EE503: Advanced Communication Theory	ML, MSE, and LS estimation	<10%	The topics are dealt with only at an introductory level while discussing their applications to carrier phase estimation, timing estimation, channel equalization.

Justification for new course proposal if cumulative similarity content is > 30%: NA

Approvals:

Other faculty interested in teaching this course: Renu Rameshan

Proposed by: Samar

School: SCEE

Signature:

Date: 3 November 2017

Recommended/Not recommended, with comments

Chairperson, Course proposal committee (CPC)

Date:

Approved / Not Approved

Chairperson, Senate

Date:

Indian Institute of Technology Mandi

Proposal for a New Course

Course Number	:	HS 252
Course Name	:	Introduction to Psychology
Credit	:	3-0-0-3
Prerequisites	:	Instructor's consent
Intended for	:	B.Tech
Semester	:	Even/Odd
Distribution	:	HSS Elective-Social Competence

Preamble

Psychology is formally defined as the study of mental processes, experiences and behaviour. The range of phenomena it studies is spread over several levels, viz. individual, dyadic, group, and organisation. This course is an introduction to some of the important areas of psychology. The emphasis here is to expose the students to a broader area of psychology.

Course Content

- 1. Nature of Psychology** (2 Hours)
Adding to what we know: The process of psychological research.
- 2. A brief history of psychology** (2 Hours)
Psychology's family album
- 3. Biopsychology** (2 Hours)
Concepts of biopsychology, reductionism,
Neuron, synapses, neurotransmitters, nervous system,
Hemisphere function
- 4. Learning** (4 Hours)
Classical Conditioning: Learning Predictable Signals
Operant Conditioning: Learning what does what.
Observational Learning: Learning from the behaviour and outcomes of others.
- 5. Cognitive Processes** (4 Hours)
Nature, emergence and stages, methods of study
- 6. Attention and Consciousness** (6 Hours)
Types: Selective, Divided and sustained

Theories: Early and late selection, Capacity and Mental efforts model
Consciousness

7. Memory (5 Hours)

What is memory?

Sensory Memory, Short term memory, and working Memory

Long Term Memory: Where past lives live!

8. Perception (6 Hours)

Attention- What is attention? Methods of studying attention.

Perceptual Constancies and Perceptual Organization.

Psychophysics, Theory of Signal Detection, Pattern/Object Perception and recognition)

9. Individual Differences (7 Hours)

Theories of Intelligence; The most (?!) controversial concept in Psychology.

The measurement of Intelligence.

Nature vs. Nurture Debate.

The Psychodynamic Perspective: Excavating the iceberg, the Trait perspective,

Learning Theory Perspective; Social-Cognitive Theory, the Humanistic Existential Perspective; the Socio-Cultural Personality

Assessing Personality.

Genetic and Environmental Component in Various Psychological Processes.

10. Affective Processes: Emotions (4 Hours)

Emotions: Adding Colour to life.

Theories of Emotions.

Text Book:

Baron, Robert A (2002). *Psychology* (5th Edition). Allyn and Bacon

Recommended Reading:

Zimbardo and Gerrig. *Psychology and Life*. Prentice Hall

Coon, D., & Mitterer, J.O. *Introduction to psychology: Gateways to mind and behaviour*. Wadsworth (Cengage Learning).

Atkinson and Hilgard's *Introduction to Psychology*. Cengage Learning.

Similarity Content Declaration with existing courses



None. This course was passed by convocation Senate, i.e. one time approval. This is a revised version of the old course for perpetual acceptance.

Other Faculty Members interested in teaching this course:

Proposed by: Shail Shankar

School: Humanities and Social Sciences

Signature _____ Date _____

The course proposal has been duly circulated and comments are attached/ no comments were received.

_____ (Dean (Academics)) Date: _____

Approved / Not Approved

Chairman, Senate

Date: _____



IIT Mandi
Proposal for a New Course

Course Number : HS550P
Course Name : Statistical Methods Practical
Credits : 0-0-2-1
Prerequisites : This course should be taken along with HS550: Statistical Methods
Intended for : Postgraduate and B.Tech.
Distribution : HSS Course – Elective
Semester : Even/Odd

1. Preamble:

The course intends to provide a hands-on training to the students on practical applications of several statistical methods that are covered under the course HS550: Statistical Methods. The course will use statistical packages, which are available for teaching on campus.

2. Course Modules with Quantitative Hours:

Module 1: Representation of Data and Descriptive Statistics (2 hrs)

Representation of data; Central tendency, dispersion, skewness, and kurtosis; Quartile and percentile; Gini coefficient and Lorenz curve; Correlation.

Module 2: Random Sampling and Parametric Statistical Inference (6 hrs)

Drawing random samples from the population –simple random sampling (with and without replacement); Sampling distribution; Statistical estimation – parametric point estimation and interval estimation; Maximum Likelihood Estimator, Hypothesis testing and calculation of effect size.

Module 3: Non-parametric Statistical Inference (6 hrs)

Carrying out non-parametric tests, estimation of location and dispersion, tolerance interval; non-parametric measures and tests of association.

Module 4: Designs of Experiment (6 hrs)

Experimental design strategies; Blocking and Randomization; Factorial design of experiments.

Module 5: Regression Analysis and ANOVA (8 hrs)

Multiple regression analysis, interpretation of estimates, testing of significance; Analysis of Variance (ANOVA) – one way ANOVA and two way ANOVA.



3. **Textbooks:** Heiman, G. W. (2011). Basic Statistics for the Behavioral Sciences. Sixth Edition. Wadsworth.

4. **References:**

1. Field, A. (2013). Discovering Statistics Using IBM SPSS Statistics. Sage Publishing.
2. Field, A., Miles, J. and Field, Z. (2012). Discovering Statistics Using R. Sage Publishing.
3. STATA Manual: <https://www.stata.com/manuals13/u.pdf>

5. **Similarity Content Declaration with Existing Courses:** None. However, this is the lab course attached to HS550: Statistical Methods and therefore the topic covered are similar.

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

Approvals:

Proposed by: Shyamasree Dasgupta

School: SHSS

Other Faculty interested in teaching this course: Dr. Varun Dutt, Dr. Puran Singh

Signature: _____

Date: _____

Recommended/Not Recommended, with Comments:

Date: _____

Chairman, CPC

Approved/Not Approved

Date: _____

Chairman, Senate



Revised Course Proposal
Indian Institute of Technology Mandi
Proposal for a New Course

Course Number : ME 355
Course Name : Internal Combustion Engines
Credits : 3-0-0-3
Prerequisites : IC 142: Engineering Thermodynamics
Intended for : UG (3rd and 4th Year)
Distribution : Discipline Elective for B. Tech. ME/ Open elective for other students
Semester : Odd/Even

Preamble: Internal combustion engines has dominated the last century as prime mover for surface transport and many other decentralized requirements of mechanical power (torque and speed). This power production system is very useful and robust combination of developments in the area of physics, chemical sciences, thermodynamics, combustion technology, control system etc. This course on internal combustion engines will expose the students with system level design concepts and integration of scientific developments in various fields into technological solution.

Course Modules with Quantitative Lecture Hours:

Module 1: (12 lecture hours)

Introduction: Classification of I.C. engine, Fundamental difference between S.I. and C.I. Engines, Comparison of two stroke and four stroke engines, various components and their functions, Types of efficiency, indicated and brake power, theory of carburetion, Air Standard cycles (Diesel, Otto, Dual, Stirling, Brayton) and their comparison, measurement and testing techniques. Thermodynamics of fuel-air cycles, real cycles, various losses in actual engines. Measurement of Indicated power, brake power, fuel consumption, energy balance analysis.

Module 2: (8 lecture hours)

Combustion and control: Combustion processes in SI engine and its various stages, spark ignition, normal and abnormal combustion, knock pre-ignition, combustion stages in CI engines, ignition delay, types of combustion systems, Fuel spray behaviour, Exhaust emissions, its measurement and control.

Module 3: (4 lecture hours)

Engine cooling and lubrication system: Temperature distributions of various components, heat transfer theory, parameters effecting engine heat transfer, need and type of cooling systems.

Engine Lubrication System: Frictional losses, various types of lubrication systems, lubrication of two stroke engines

Module 4: (8 lecture hours)

Fuel Injection and Ignition systems: Requirement of Air fuel mixing, fuel properties and its measurement, fuel injection system in SI engines, fuel injection system in CI engines, turbocharging, ignition systems

Module 5: (10 lecture hours)



Advances in Road Transport: Hybrid vehicles; electric vehicles; fuel cell powered vehicles; hydrogen fuelled engines; new combustion Modes for IC engines such as low temperature combustion, homogenous charge compression ignition, reactivity controlled combustion etc.

Textbooks:

- (i) V Ganesan, Internal Combustion Engines 4/E, McGraw Hill Education, 2017
- (ii) J B Heywood, Internal Combustion Engine Fundamentals 1/E, McGraw Hill, Inc. 1988.

Reference Books:

- (i) M L Sharma and M P Mathur, Internal Combustion Engines, Dhanpat Rai Publications New Delhi, 2016.
- (ii) Richard Stone, Introduction to Internal Combustion Engines, Society of Automotive Engineers, 1999.
- (iii) Paul W. Gill and James H. Smith, Fundamental of Internal Combustion Engines, 4/E, Oxford & IBH Publishing Company Pvt. Limited, 2007.

Similarity content declaration with existing courses:

Sl. No.	Course Code	Similarity Content	Approximate % of Content
1	IC 142 Engineering Thermodynamics	Thermodynamic Cycles	<5
2	ME307 Energy Conversion Devices	Introduction to IC Engines	5

Justification for new course proposal if cumulative similarity content is > 30%:

Not Applicable.

Approvals:

Other faculty interested in teaching this course: Dr. P. Anil Kishan, Dr. M Talha, Dr. Pradeep Kumar, Dr. Dhiraj V Patil, Dr. Gaurav Bhutani

Proposed by: Dr. Atul Dhar

School: School of Engineering (SE)

Signature:

Date:

Recommended / Not Recommended, with comments:

Chairman, CPC

Date:



Approved / Not Approved:

Chairman, Senate

Date:

Point wise Response on CIG Comments:

1. In preamble last sentence: word “various” is redundant.

Response: “various” has been replaced with “”diverse”

2. In module 1: Energy balance analysis should be added.

Response: In the modified proposal “energy balance analysis” has been added.

3. Module 2: “Thermodynamics of fuel-air cycles, real cycles, various losses in actual engines.” This part may be placed in module 1 and suitably lecture hours should be modified.

Response: Suggested part has been shifted to module 1 and lecture hours has been accordingly modified.

4. From module 2: “Thermochemistry of fuel air mixtures: combustion stoichiometry, first and laws of thermodynamics and combustion.” May be removed.

Response: Suggested part has been removed. Thanks for the suggestion.

5. Module 4: First topic may be modified to “Requirements for air-fuel mixing”

Response: Modified.

6. In the prerequisites IC 142: Thermodynamics may be added.

Response: Added.

7. Following books may be added as reference books:

M L Sharma and M P Mathur, Internal Combustion Engines, Dhanpat Rai Publications (2016), New Delhi.

Richard Stone, Introduction to Internal Combustion Engines, Society of Automotive Engineers, 1999.

Paul W. Gill and James H. Smith, Fundamental Of Internal Combustion Engines, 4/E, Oxford & IBH Publishing Company Pvt. Limited, 2007

Response: Suggested reference books has been added.

8. It was suggested that it is a basic course and many faculty members are interested in teaching, hence list of faculty members interested in teaching should include more names.

Response: Suggested list has been modified.

Comments Received Through FDB:

No comments received.