Date: 06/03/2018

BOARD OF STUDIES (Computer Science & Engineering and IT)
MINUTES OF THE MEETING
(09 Pages Only)

1. A meeting of board of studies of Department of Computer Science & Engineering and IT, Amity School of Engineering & Technology, Amity University Madhya Pradesh was held on March 06, 2018 at AUMP, under the Chairmanship of Maj Gen (Dr) SC Jain, VSM** (Retd), Director (ASET). The following members attended the meeting:-

   (a) **Chairman:** Maj Gen (Dr) SC Jain, VSM** (Retd), Director (ASET)

   (b) **Member**

   i) Prof. (Dr.) Sanjay Kumar Gupta, Professor & Head Computer Science and Application Jiwaji University, Gwalior, External Member

   ii) Mr. Hemant Kumar Soni, Asst. Prof & Offg. Head – CSE

   iii) Dr. A. K. Upadhyay, Professor

   iv) Mr. Ashok Kumar Shrivastava, Asst. Professor

2. The agenda of the meeting included the following:
   (a) Review of existing syllabus and modification if any.
   (b) Discussion on trends and technologies in CSE and consideration of its inclusion in syllabus.
   (c) Any other point with due permission of the Chairperson.

3. Discussions/Comments:

a. (i) Discussion: National / International Conferences provide a platform to students, researchers and faculty members to know about latest in research area.

(ii) Comments: Through National / International Conference an opportunity is created to contribute and update knowledge. The department of CSE organises National Conference every year to enable students to showcase their research findings.

b. (i) Discussion: —

(ii) Comments:

c. (i) Discussion: —

(ii) Comments:

4. Recommendations:

B. Tech Program:

i. Industrial Visit is added as one additional module in BTC/BTI/BCA-303 of III sem. BTC/BTI/BCA-503 of V sem. and BTC/BTI-701 of VII semester respectively. This addition is for better exposure about industry to the students. (Refer Annexure-1)

ii. In place of BTC 602 System Programming by introducing new paper Internet of Things (IOT) with same paper code BTC 602 and same credit 3. (Refer Annexure-2)

iii. In place of BTI 602 System Programming by introducing new paper Internet of Things (IOT) with same paper code BTI 602 and same credit 3 (Refer Annexure-3)

iv. In BTC 505 Java Programming, updated and systematically arranged entire syllabus. (Refer Annexure-4)

v. In BTI 505 Java Programming, updated and systematically arranged entire syllabus. (Refer Annexure-5)

BCA Program:

i. In BCA 502 Java Programming, updated and systematically arranged entire syllabus. (Refer Annexure-6)

M. Tech Program:

There is no change in the scheme and syllabus of the course.

Pre Ph.D. Course:

There is no change in the scheme and syllabus of the course.

CBCS:

i In NS4404 Wireless and Mobile Network a new module IV is added and credit changed from 3 to 4. (Annexure-7)

ii. In NS4405 Cryptography And Network Security modify the content of Module I,II and III and credit changed from 3 to 4.

iii. In NS4406 project (Network Security) credit modify from 3 to 1.

iv. In CC4503 Storage and Computer Virtualization module II removed to simplify the syllabus. (Annexure-8)

v. In CC4504 Network Virtualization a new module IV is added and credit changed from 3 to 4.

vi. In CC4505 Cloud Computing a new module VI is added and credit changed from 3 to 4.

vii. In CC4506 project is added in-place of paper Information Storage and Management and credit modify from 3 to 1.

viii. Introducing new CBCS namely Web Technologies with the six subjects namely WT4601 Fundamental of computers, WT4602 Operating System and Application Program, WT4603 Web Technologies, WT4604 Introduction to Client Side Programming using Java Script, WT4605 Introduction To Open Source Technologies (PHP) and WT4606 Project (Web Technology) the syllabus for all 6 semesters is designed to make it interesting for students of other branches/Institutions.(Annexure-9)

All the aforesaid points have been approved by all the board members present in the meeting.

5. Summary of changes is given below:-

Current Syllabus					Proposed Changes/Modifications (addition/deletion in the Syllabus)	New Course Code	No. of Credits
Sr. No.	Course Title	Module of the syllabus	Old Course Code	No. of Credits			
1.					Additional module of Industrial visit is added in III, V and VII Sem. without any change in syllabus	BTC/BTI/BCA-303, BTC/BTI/BCA - 503, BTC/BTI-701	
2.	IOT	All	BTC 602	3	Introducing New Paper IOT in place of System Programming	BTC 602	3
3.	IOT	All	BTI 602	3	Introducing New Paper IOT in place of System Programming	BTI 602	3
4.	Java Programming	All	BTC 505	4	Improvised and systematically arranged entire syllabus	BTC 505	4
5.	Java Programming	All	BTI 505	4	Improvised and systematically arranged entire syllabus	BTI 505	4
6.	Java Programming	All	BCA 502	4	Improvised and systematically arranged entire syllabus	BCA 502	4
7	Network Security (Wireless And Mobile Network) (CBCS)	New Module	NS4404	3	Addition of Module VI (Change in credit due to reallocate credits to courses of minor track	NS4404	4
8.	Network Security (Cryptography And Network Security)(CBCS)	I, II and III	NS4405	3	Modifications in Module I, II and III (Change in credit due to reallocate credits to courses of minor track)	NS4405	4
9	Network Security (Project)(CBCS)		NS4406	3	Change in credit due to reallocate credits to courses of minor track	NS4406	1
10.	Cloud Computing (STORAGE AND COMPUTER VIRTUALIZATION) (CBCS)	II	CC4503	3	Removed Module II	CC4503	3

11	Cloud Computing **(Network Virtualization)** (CBCS)	Module IV	CC4504	3	Addition of Module IV (Change in credit due to reallocate credits to courses of minor track)	CC4504	4
12	Cloud Computing **(CLOUD COMPUTING)** (CBCS)	Module VI	CC4505	3	Addition of Module VI (Change in credit due to reallocate credits to courses of minor track)	CC4505	4
13	Cloud Computing **(Project)** (CBCS)	ALL	CC4506	3	Introducing new paper as project. (Change in credit due to reallocate credits to courses of minor track)	CC4506	1
14	Web Technology(Fundamental of computers) (CBCS)	All			Introducing new subject in CBCS	WT4601	3
15	Web Technology (Operating System and Application Program) (CBCS)	All			Introducing new subject in CBCS	WT4602	3
16	Web Technology(Web Technologies) (CBCS)	All			Introducing new subject in CBCS	WT4603	3
17	Web Technology(Introduction of Client Side Programming using Java Script)) (CBCS)	All			Introducing new subject in CBCS	WT4604	4
18	Web Technology(Introduction To Open Source Technologies(Php)) (CBCS)	All			Introducing new subject in CBCS	WT4605	4
19	Web Technology (Project) (CBCS)	All			Introducing new subject in CBCS	WT4606	1
Total Credit				39 (18 Th + 21 CBCS)	57 (18 Theory + 39 CBCS)		

The total number of credits after revision for B. Tech CSE works out to 7 credits as against 7 credits, B.Tech. IT works out to 7 credits as against 7 credits, BCA works out to 4 credits as against 4 credits, and the credits for M. Tech. remains same. The total number of credits after revision for CBCS works out to 21 credits as against 21 credits and introduced one new CBCS of 18 credits.

Signature of Members:

Mr. Ashok Kumar Shrivastava

Dr. AK Upadhyay

Mr. Hemant Kumar Soni

Prof. (Dr.) Sanjay Gupta
External Member

Maj Gen (Dr) S C Jain
Chairman- BOS

07/03/18

Prof.(Dr.) M.P. Kaushik
Hon'ble Pro Vice Chancellor
AUMP, Gwalior

APPROVED BY

12/3/18

Hon'ble Vice Chancellor
AUMP, Gwalior

AMITY UNIVERSITY
MADHYA PRADESH
(Established by Ritnand Balved Education Foundation)

MEETING OF BOARD OF STUDIES (BOS)
(Computer Science & Engineering and IT)
Amity School of Engineering & Technology

Remarks & Suggestions by BOS Members

-1. Faculty should be encouraged to take membership of Standard research forums like IEEE, ISTC and CSI etc..

-2. While teaching, faculty should emphasize on latest technologies and should include case studies to illustrate concepts.

Signature of Members:

Maj Gen (Dr) SC Jain

Prof. (Dr.) Sanjay Gupta

Mr. Hemant Kumar Soni

Dr. AK Upadhyay

Mr. Ashok Kumar Shrivastava

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Amity School of Engineering & Technology

Remarks & Suggestions by BOS Members

-1- The Courses should be designed in such a way that they are more practical oriented and are real time based.

-2- Course should be designed so as to include Web Technology Concepts.

-3- Students should be motivated to develop writing skills.

Signature of Members:

Maj Gen (Dr) SC Jain

Prof. (Dr.) Sanjay Gupta

Mr. Hemant Kumar Soni

Dr. AK Upadhyay

Mr. Ashok Kumar Shrivastava

AMITY UNIVERSITY

MADHYA PRADESH

(Established by Ritnand Balved Education Foundation)

Date: 16/01/2018

BOARD OF STUDIES (Civil Engineering)
MINUTES OF THE MEETING

1. A meeting of board of studies of Department of Civil Engineering, Amity School of Engineering & Technology, Amity University Madhya Pradesh was held on 16 January 2018 at AUMP, under the Chairmanship of Maj Gen (Dr) S C Jain VSM **(Retd), Director (ASET). The following members attended the meeting:-

   (a) Chairman: Maj Gen (Dr) S C Jain VSM **(Retd), Director (ASET)

   (b) Member

   i) Dr. Manoj Kumar Trivedi, Professor, MITS , Gwalior, External Member

   ii) Mr. Mohan Kantharia Asst.Professor & Head Civil Engg., Member

   iii) Ms. Pooja Shrivastava, Assistant Professor, Civil Engg., Member

   iv) Mr. Shashank Gupta , Assistant Professor, Civil Engg., Member

2. The agenda of the meeting included the following:
   (a) Review of existing syllabus and modification if any.
   (b) Discussion on trends and technologies in CE and consideration of its inclusion in syllabus.
   (c) Any other point with due permission of the Chairperson.

3. **Discussions/Comments:**

a. (i) Discussion: Diagonstic lab set up

(ii) Comments: for Material testing Concrete and Mortar. diagonstic lab should be set up.

b. (i) Discussion: M.tech in CTM/ Transportation

(ii) Comments: M.tech courses in these specization can be started because these specilization are in demand.

c. (i) Discussion: UG and PG Journals

(ii) Comments: ASCE and ACI Journals should be subcribed for PG and UG students.

3. **Discussions/Comments:**

a. (i) Discussion: Diagonstic lab set up

(ii) Comments: for Material testing Concrete and Mortar. diagonstic lab should be set up.

b. (i) Discussion: M.tech in CTM/ Transportation

(ii) Comments: M.tech courses in these specization can be started because these specilization are in demand.

c. (i) Discussion: UG and PG Journals

(ii) Comments: ASCE and ACI Journals should be subcribed for PG and UG students.

1. Recommendations:

B. Tech Program:

1. Industrial visit is added as one additional module every year curriculum. In third semester (BTCE-305) one day local industry visit. In fifth semester (BTCE-503) industrial visit will be of maximum two working days. In seventh semester (BTCE-702) Industrial visit will be of maximum three working days respectively. This addition is for better exposure about industry to the students. **(Annexure -I)**

2. The subject Building Design and Drawing (BTCE-302) is revised according to the present need of the subject, some part which is of architecture from part A is removed, and the part B drawing is already covered in the BDD Lab , hence removed. Now new course will be of 3 credits in place of 4 credits presently. Syllabi of some other institution for the same subject are also referred for modification.**(Annexure-II)**

M. Tech Program:

3. There is no **change** is proposed in current syllabus of M.Tech. program.

CBCS Course:

4. Currently we are running one course in CBCS with name **Construction Engineering**. The credits of semester IV, V, and VI have been revised. In place of 3 credits in each semester, semester(IV) credits 4, semester(V) credits 4 and semester (VI) credits 1 are proposed in these semesters. Total credits of CBCS remains 18.
5. All the aforesaid points have been approved by all the board members present in the meeting.

5. Summary of Changes is given below:-

Current Syllabus B.Tech (CE)					**Proposed** Changes/Modifications (addition/deletion in the Syllabus)	New Course Code B.Tech (CE)	No. of Credits
Sr. No.	Course Title	Module of the syllabus	Old Course Code	No. of Credits			
1	Building Technology Geotechnical Engg Environmental Engg.	(Presently These courses **having IV modules** in the old syllabus)	BTCE-305 BTCE-503 BTCE-702	3 3 3	**Additional module (V)** of **Industrial visit** is **added** in III, V and VII Semester (**without any change in syllabus) (List of probable industries is attached)**	BTCE-305 BTCE-503 BTCE-702	3 3 3
2	Building Design and Drawing	Module I. Function of architecture Module II. Creative principles ModuleIII: Functional Factors Module IV:spaces Planning of residential and public building Perspective drawing Part B: Drawing	BTCE-302	**4**	**Revised syllabus** 1.Some part of module I is added in Vth module . Module1(added)Building elements to make understanding of basics of building drawing. 2.some part of this module is added in module V and Module 2(Building Bye Laws) is **added** as required in civil engineering Module III:building Services contents is same as old syllabus . Module 4 :design and drawing of building ,residential and public buildings This is totally covered in drawing Lab separately in subject BTCE-321. **Module 5**: Perspective	BTCE-302	**3**

					drawing : (newly added) Contains some part of module I and Module II amd Module IV of old syllabus)		
3	CBCS (construction Engineering)		CE4904 CE4905 CE4906	3 3 3	Vi semester Syllabus slightly shuffled to 4th and 5th semester **Project (in sixth semester)**		4 4 1
				Total Credits =22			Total Credits=21

The total number of credits after revision for B. Tech works out to **21credits** as against **22 credits,** and the credits for **M.Tech** remains same.

Signature of BOS Members:

Ms. Pooja Shrivastava
Member

Mr. Shashank Gupta
Member

Mr. Mohan Kantharia
Member

Dr. Manoj Kumar Trivedi
External

Maj Gen (Dr) S C Jain
Chairman-BOS

Prof.(Dr.) M.P.Kaushik
Hon'ble Pro vice Chancellor
AUMP

APPROVED BY

Hon'ble Vice Chancellor
AUMP, Gwalior

Bachelor of Technology
(Civil Engineering)

Programme Code: BTCE

Duration – 4 Years Full Time

Programme Structure
&
Curriculum & Scheme of Examination

2018-19
(As per AICTE)

14-5-18

AMITY UNIVERSITY
MADHYA PRADESH

PREAMBLE

Amity University aims to achieve academic excellence by providing multi-faceted education to students and encourage them to reach the pinnacle of success. The University has designed a system that would provide rigorous academic programme with necessary skills to enable them to excel in their careers.

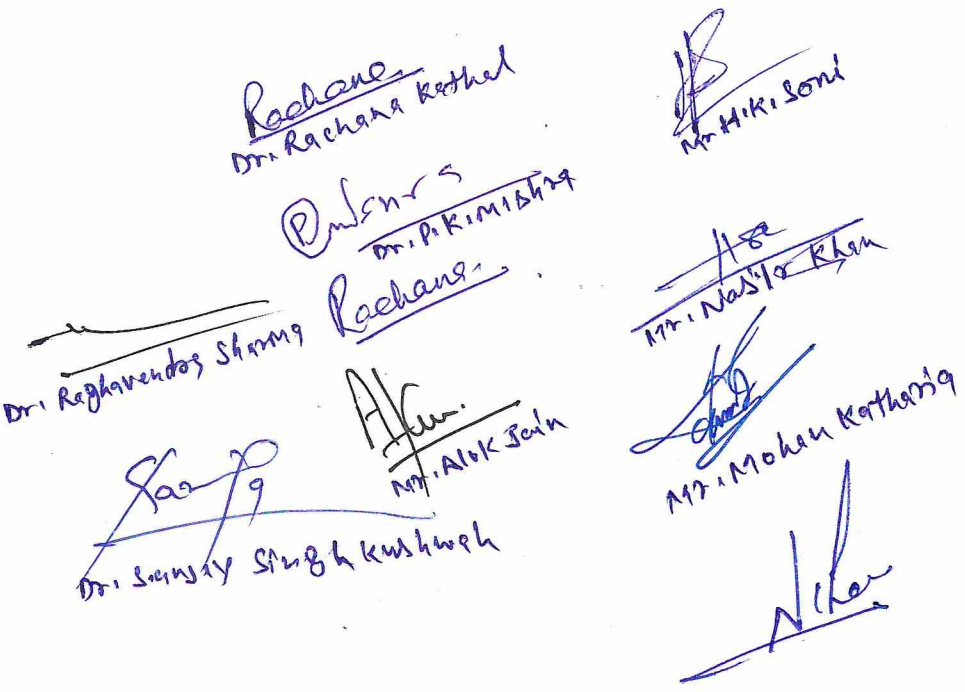
This booklet contains the Programme Structure, the Detailed Curriculum and the Scheme of Examination. The Programme Structure includes the courses (Core and Elective), arranged semester wise. The importance of each course is defined in terms of credits attached to it. The credit units attached to each course has been further defined in terms of contact hours i.e. Lecture Hours (L), Tutorial Hours (T), Practical Hours (P). Towards earning credits in terms of contact hours, 1 Lecture and 1 Tutorial per week are rated as 1 credit each and 2 Practical hours per week are rated as 1 credit. Thus, for example, an L-T-P structure of 3-0-0 will have 3 credits, 3-1-0 will have 4 credits, and 3-1-2 will have 5 credits.

The Curriculum and Scheme of Examination of each course includes the course objectives, course contents, scheme of examination and the list of text and references. The scheme of examination defines the various components of evaluation and the weightage attached to each component. The different codes used for the components of evaluation and the weightage attached to them are:

Components	Codes	Weightage (%)
Case Discussion/ Presentation/ Analysis	C	05 - 10
Home Assignment	H	05 - 10
Project	P	05 - 10
Seminar	S	05 - 10
Viva	V	05 - 10
Quiz	Q	05 - 10
Class Test	CT	10 - 15
Attendance	A	05
End Semester Examination	EE	70

It is hoped that it will help the students study in a planned and a structured manner and promote effective learning. Wishing you an intellectually stimulating stay at Amity University.

May, 2018



Maj Gen (Dr) S C Jain

PROGRAM OUTCOMES

PO1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. Design/Development of Solutions :Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4. Conduct Investigations of Complex Problems :Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6. The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PO12. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects

PROGRAM SPECIFIC OUTCOMES

PSO1. Apply principles of mechanics and basic sciences to analyze civil engineering structures
PSO2. Survey, map, measure and analyze data for sustainable infrastructure planning.
PSO3. Characterize and evaluate materials for adoptability in civil engineering projects.
PSO4. Analyze and design concrete & steel structures, earthen embankments, irrigation structures, water supply, waste treatment systems and transport systems.
PSO5. Apply best management practices for construction and maintenance of infrastructure facilities.
PSO6. Predict and forecast societal needs, floods, droughts, pollution and travel demand.
PSO7. Work and lead in multi-disciplinary projects and demonstrate social responsibility and professional ethics.
PSO8. Engage in research and life-long learning to adapt to changing environment.

PROGRAMME STRUCTURE

FIRST SEMESTER						
Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits	Hours
BTCE-101	Mathematics – I (Calculus and Linear Algebra)	3	1	-	4	40
BTCE-102	Chemistry – I (Concepts in Chemistry for Engineering)	3	1	-	4	40
BTCE-103	Basic Electrical Engineering	3	1	-	4	40
BTCE-104	Engineering Graphics & Design	1	-	-	1	10
BTCE-120	Chemistry - I Lab	-	-	3	1.5	30
BTCE-121	Basic Electrical Engineering Lab	-	-	2	1	20
BTCE-122	Engineering Graphics & Design Lab	-	-	4	2	40
BTCE-141	Communication Skill-I (English Language Usage Essentials)	1	-	-	1	10
BTCE-142	Environmental Studies - I	2	-	-	2	20
BTCE-143	Behavioural Science - I	1	-	-	1	10
BTCE-144	French - I	2	-	-	2	20
CBCS		3	-	-	3	30
TOTAL CREDITS (Including CBCS)					**26.5**	
Total Hrs Including CBCS per week					**31**	
Total Hrs in the Semester					**310**	

SECOND SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
BTCE-201	Mathematics – II (Ordinary Differential Equations And Complex Variable)	3	1	-	4	40
BTCE-202	Physics (Mechanics)	3	1	-	4	40
BTCE-203	Programming for Problem Solving	3	-	-	3	30
BTCE-204	Workshop/ Manufacturing Practices	1	-	-	1	10
BTCE-220	Physics (Mechanics) Lab	-	-	3	1.5	30
BTCE-221	Programming for Problem Solving Lab	-	-	4	2	40
BTCE-222	Workshop/ Manufacturing Practices Lab	-	-	4	2	40
BTCE-241	Communication Skill-II (Introduction to Communication Skill)	1	-	-	1	10
BTCE-242	Environmental Studies - II	2	-	-	2	20
BTCE-243	Behavioural Science - II	1	-	-	1	10
BTCE-244	French - II	2	-	-	2	20
CBCS		3	-	-	3	30
TOTAL CREDITS (Including CBCS)					**26.5**	
Total Hrs Including CBCS					**32**	
Total Hrs in the Semester					**320**	

MODEL CURRICULAM

1st YEAR

(AICTE)

MATHEMATICS-I (CALCULUS AND LINEAR ALGEBRA)

Course Code: BTCE-101 **Credit Units: 04**
Total Hours: 40

Course Objective:
The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Module 1: Calculus (9 Hours)
Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions ,Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

Module 2: Sequences and series (7 Hours)
Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 3: Multivariable Calculus (Differentiation) (9 Hours)
Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Jacobians and transformations of coordinates Method of Lagrange multipliers; Gradient, curl and divergence.

Module 4: Matrices and Vector Space (8 Hours)
Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation, Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank- nullity theorem, composition of linear maps, Matrix associated with a linear map. Inner product spaces, Gram-Schmidt orthogonalization.

Module 5: Multivariable Calculus (Integration) (7 Hours)
Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

Course Outcomes

- To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
- The fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
- The tool of power series and Fourier series for learning advanced Engineering Mathematics.
- To deal with functions of several variables that are essential in most branches of engineering.
- The essential tool of matrices and linear algebra in a comprehensive manner.
- The mathematical tools needed in evaluating multiple integrals and their usage.

CHEMISTRY-1 (CONCEPTS IN CHEMISTRY FOR ENGINEERING)

Course Code: BTCE -102 **Credit Units:04**
Total Hours: 40

Course Objective:
Technology is being increasingly based on the electronic, atomic and molecular level modifications. The course will have a strong emphasis on the concepts that will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will emphasize on learning microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. Principles of different spectroscopic techniques will be introduced and some applications will be considered. Bulk properties and processes will be analysed using thermodynamic considerations. There will also be outlines of periodic properties, stereochemistry, chemical reactions and synthesis. The chemistry laboratory course will consist of experiments illustrating the principles of chemistry that have been learnt so far, as well as others relevant to the study of science and engineering.

Module 1: Atomic and molecular structure (12 hours)
Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nanoparticles. Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multicentre orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

Module 2: Spectroscopic techniques and applications (8 hours)
Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques. Diffraction and scattering.

Module 3: Intermolecular forces and potential energy surfaces (4 hours)
Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3, H_2F and HCN and trajectories on these surfaces.

Module 4: Use of free energy in chemical equilibria (6 hours)
Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy considerations in metallurgy through Ellingham diagrams.

Module 5: Periodic properties (4 hours)
Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

Module 6: Stereochemistry (4 hours)
Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.

Module 7: Organic reactions and synthesis of a drug molecule (2 hours)
Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

BASIC ELECTRICAL ENGINEERING

Course Code: BTCE - 103

Credit Units: 04
Total Hours: 40

Course Objective:
The objective of the course is to provide a brief knowledge of Electrical Engineering to students of all disciplines. This Course includes some theorems related to electrical, some law's related to flow of current, voltages, basic knowledge of Transformer, basic knowledge of electromagnetism, basic knowledge of electrical network.

Module 1: DC Circuits (8 hours)
Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin's and Norton's Theorems. Time-domain analysis of first-order RL and RC circuits.

Module 2: AC Circuits (8 hours)
Representation of sinusoidal waveforms, peak and R.M.S. values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three- phase balanced circuits, voltage and current relations in star and delta connections.

Module 3: Transformers (6 hours)
Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module 4: Electrical Machines (8 hours)
Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

Module 5: Power Converters (5 hours)
DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

Module 6: Electrical Installations (5 hours)
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Course Outcomes:

- To understand and analyze basic electric and magnetic circuits.
- To study the working principles of electrical machines and power converters.
- To introduce the components of low voltage electrical installations.

Examination Scheme:

Components	A	CT	S/V/Q/HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering" , Tata McGraw Hill, 2010.
- D. C. Kulshreshtha, " Basic Electrical Engineering", McGraw Hill, 2009.
- L. S. Bobrow, " Fundamentals of Electrical Engineering", Oxford University Press, 2011.
- E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
- V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

CHEMISTRY LABORATORY

Course Code: BTCE 120

Credit Units: 1.5
Total Hours: 30

List of experiments/demonstrations:

1. Determination of surface tension of a given liquid. **(2 Hours)**
2. Determination of viscosity of a given liquid. **(2 Hours)**
3. Thin layer chromatography. **(1 Hour)**
4. Ion exchange column for removal of hardness of water. **(2 Hours)**
5. Determination of chloride content of water. **(1 Hour)**
6. Colligative properties using freezing point depression. **(2 Hours)**
7. Determination of the rate constant of a reaction. **(2 Hours)**
8. Determination of cell constant and conductance of solutions. **(2 Hours)**
9. Potentiometry - determination of redox potentials and emfs. **(2 Hours)**
10. Synthesis of a polymer/drug. **(1 Hour)**
11. Saponification/acid value of an oil. **(2 Hours)**
12. Chemical analysis of a salt. **(1 Hour)**
13. Lattice structures and packing of spheres **(1 Hour)**
14. Models of potential energy surfaces. **(1 Hour)**
15. Chemical oscillations- Iodine clock reaction. **(1 Hour)**
16. Determination of the partition coefficient of a substance between two immiscible liquids. **(3 Hours)**
17. Adsorption of acetic acid by charcoal. **(2 Hours)**
18. Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of the egg. **(2 Hours)**

Laboratory Outcomes:

- The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
- Estimate rate constants of reactions from concentration of reactants/products as a
- function of time
- Measure molecular/system properties such as surface tension, viscosity,
- conductance of solutions, redox potentials, chloride content of water, etc
- Synthesize a small drug molecule and analyse a salt sample

Examination Scheme:

Components	A	CT	S/V/Q/HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

ENGINEERING GRAPHICS & DESIGN LABORATORY

Course Code: BTCE 122

Credit Units: 02
Total Hours: 40

List of experiments/demonstrations:

Module 1: Introduction to Engineering Drawing (4 Hours)
Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales

Module 2: Orthographic Projections (4 Hours)
Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes

Module 3: Projections of Regular Solids (4 Hours)
Those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Module 4: Sections and Sectional Views of Right Angular Solids (4 Hours)
Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

Module 5: Isometric Projections (4 Hours)
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions

Module 6: Overview of Computer Graphics (4 Hours)
Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids

Module 7: Customization & CAD Drawing (4 Hours)
consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles

Module 8: Annotations, layering & other functions (6 Hours)
Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling

Module 9: Demonstration of a simple team design project (6 hours)
Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM)

COMMUNICATION SKILLS-I (ENGLISH LANGUAGE USAGE ESSENTIALS)

Course Code: BTCE-141

Credit Units: 01
Total Hours: 10

Course Objective The course is intended to familiarize students with the basics of English language and help them to learn to identify language structures for correct English usage.

Module I: Essentials of English Grammar (4 Hours)

- Common Errors, Parts of Speech, Collocations, Relative Pronoun, Subject-Verb Agreement, Articles , Punctuation, Sentence Structure- 'Wh' Questions

Module II: Written English Communication (2 Hours)

- Paragraph Writing, Essay Writing

Module III: Spoken English Communication (2 Hours)

- Introduction to Phonetics, Syllable-Consonant and Vowel Sounds, Stress and Intonation

Module IV: Prose (2 Hours)

- "Friends, Romans, countrymen, lend me your ears" Speech by Marc Anthony in Julius Caeser

Learning Outcomes:

- The students should be able to :
- Identify Common Errors and Rectify Them
- Develop and Expand Writing Skills Through Controlled and Guided Activities
- To Develop Coherence, Cohesion and Competence in Oral Discourse through Intelligible Pronunciation

Examination Scheme:				
Components (Drop down)	CIE	Mid Sem	Attendance	ESE
Weightage (%)	30%	15%	5%	50%

CIE: Continuous Internal Evaluation, Mid Sem, Attendance, ESE: End Semester Examination

Text & References:

Text:

- Rosenblum, M. How to Build Better Vocabulary, London: Bloomsbury Publication
- Verma, Shalini. Word Power made Handy, S. Chand Publications
- High School English Grammar & Composition by Wren & Martin

References:

- K.K.Sinha , Business Communication, Galgotia Publishing Company
- Additional Reading: Newspapers and Journals

Module VI: End-of-Semester Appraisal

- Viva - Voce based on personal journal
- Assessment of Behavioral change as a result of training
- Exit Level Rating by Self and Observer

Course Outcome:

Through this course,

- The knowledge of self will be utilized by students to resolve their personal, interpersonal and life problems
- Rather than extrinsic locus of control, students will acquire an intrinsic approach towards life
- The heightened awareness of self, attitudes and emotions will help students to work towards removal of obstacles created by self-limitations and enhance their full potential in their education and career.

Examination Scheme:

Components	SAP	A	Mid Term Test (CT)	VIVA	Journal for Success (JOS)
Weightage (%)	20	05	20	30	25

Suggested Readings:

- Organizational Behaviour, Davis, K.
- Hoover, Judhith D. Effective Small Group and Team Communication, 2002,Harcourt College Publishers
- Dick, Mc Cann & Margerison, Charles: Team Management, 1992 Edition, viva books
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- LaFasto and Larson: When Teams Work Best, 2001, Response Books (Sage), New Delhi
- J William Pfeiffer (ed.) Theories and Models in Applied Behavioural Science, Vol 2, Group (1996); Pfeiffer & Company
- Smither Robert D.; The Psychology of Work and Human Performance, 1994, Harper Collins College Publishers

FRENCH-I (FRANÇAIS POUR LA TECHNOLOGIE –I)

Course Code: BTCE-144

Credit Units: 02
Total Hours: 20

Course Objective:

To enable the students to take position as a foreigner speaking French and establish contacts and speak about self.
To provide an understanding of the basics of French lexicology, grammar and phonetics
To familiarize the students

- with the manners and socio-cultural aspects
- with the transparent words in science and specialties
- with formal and informal language

Course Contents: pp. 1 to 28: Unité 1
This course is structured based on the text book Tech French: French for Science and Technology and prepares the Students for A1 / A2 of DELF.

Unité 1: Premiers pas en France
Actes de Communication : (12 Hours)
Saluer - accueillir, identifier, nommer quelqu'un
Se présenter, présenter quelqu'un - nom, âge, nationalité, profession, spécialisation, ville, pays
Aborder une personne - prise de contact, politesse, famille
Présenter des renseignements personnels - remplir un formulaire, adresse, numéro de téléphone
Demander des nouvelles - comprendre et poser des questions
Parler de soi - de ses activités, de ses loisirs, exprimer ses goûts

Grammaire : (8 Hours)
Articles indéfinis et définis
Accord - masculin et féminin
Pronoms personnels sujets, toniques, on, c'est/il est + profession
Verbes au présent : du 1er groupe -er (habiter), être, avoir, faire, savoir, aller
Formes : négation, interrogation
Prépositions de lieu
Adjectifs possessifs - un seul possesseur et plusieurs possesseurs
Partitif – faire/ jouer + à/ de…

Course Outcomes:

- To understand basic French. Able to read, write basic French
- To express basic day to day activities in French

Examination Scheme:

	Internal exam				End semester	Grand total
Components	Mid-Sem	Viva-Voce	Attendance	**TOTAL**		
Weightage (%)	15	30	5	**50**	**50**	**100**

Text & References:

Text:

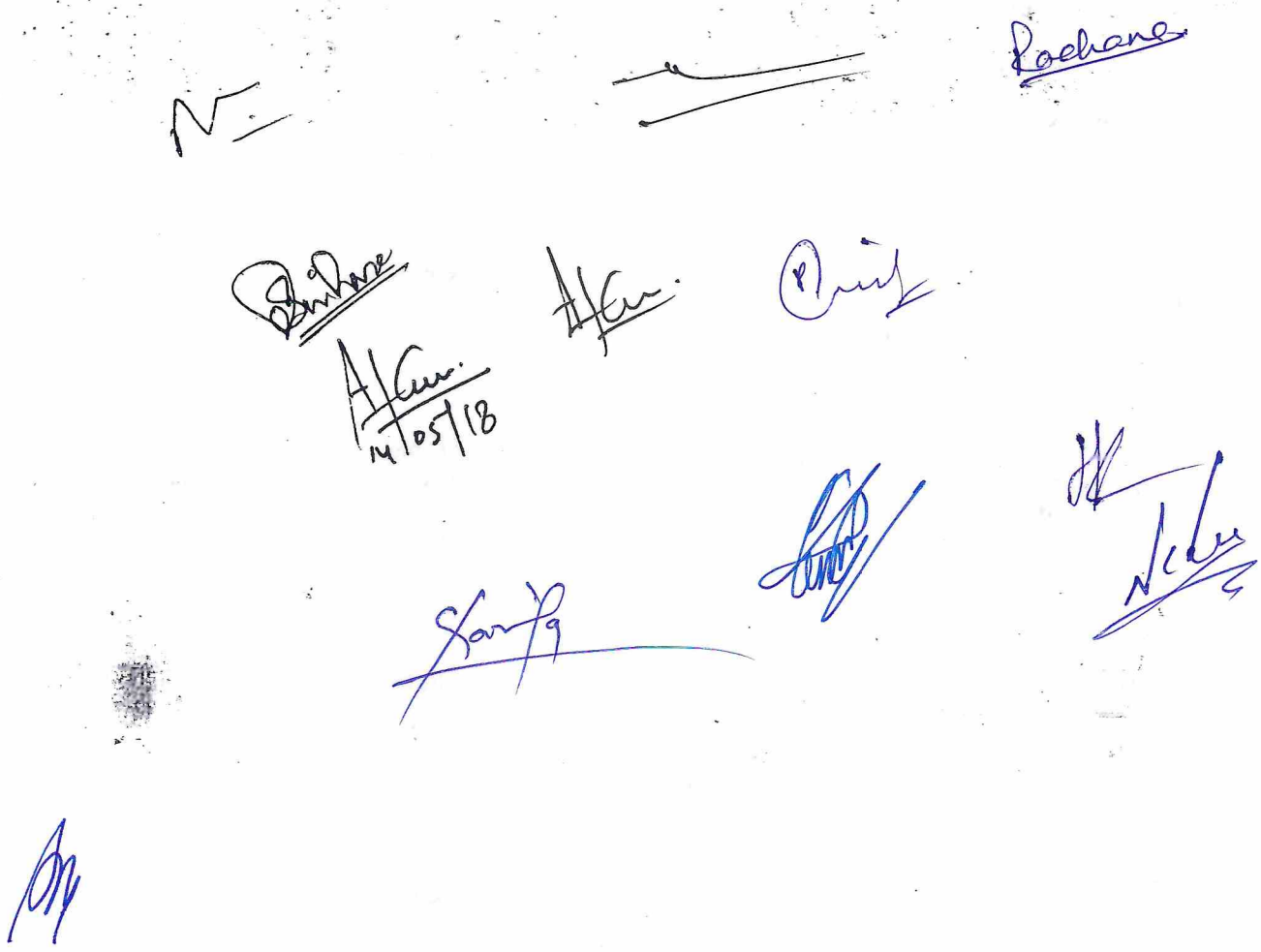
- **Le livre à suivre:** Le Gargasson, Ingrid, Shariva Naik et Claire Chaize. Tech French: French for Science and Technology. Delhi: Goyal Publishers & Distributors Pvt. Ltd., 2011.

References:

Girardeau, Bruno et Nelly Mous. Réussir le DELF A1. Paris: Didier, 2010.

Suggested Text/Reference Books

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, an Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.



Text & References:

References:

- Engineering Mechanics, 2nd ed. — MK Harbola
- Introduction to Mechanics — MK Verma
- An Introduction to Mechanics — D Kleppner & R Kolenkow
- Principles of Mechanics — JL Synge & BA Griffiths
- Mechanics — JP Den Hartog
- Engineering Mechanics - Dynamics, 7th ed. - JL Meriam
- Mechanical Vibrations — JP Den Hartog
- Theory of Vibrations with Applications — WT Thomson

Examination Scheme:

Components	A	CT	S/V/Q/HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
- Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

PHYSICS (MECHANICS) LAB

Course Code: BTCE- 220

Credit Units: 1.5
Total Hours: 30

Course Objectives

To develop experimental skills, analysis/interpretation of data, and synthesis of the information to provide valid conclusions towards theoretical concepts of applied mechanics.

List of Experiments

1. To determine the frequency of an electrically maintained tunning fork by Melde's method. **(2 hours)**
2. To determine the frequency of AC mains using sonometer. **(2 hours)**
3. To determine the acceleration due to gravity ("g") using Keter's reversible pendulum. **(2 hours)**
4. To determine the value of acceleration due to gravity ("g") in the laboratory using bar pendulum. **(2 hours)**
5. To determine the moment of inertia of a flywheel about its own axis of rotation. **(2 hours)**
6. To determine the density of material of the given wire with the help of sonometer. **(2 hours)**
7. Determination of Modulus of rigidity 'η' of rod by Searle's method. **(3 hours)**
8. Measurement of Young's modulus by bending of beam method. **(3 hours)**
9. To determine the coefficient of viscosity of a liquid by poiseuille's method. **(3 hours)**
10. To determine the rigidity modulus of the suspension wire using torsion pendulum. **(3 hours)**
11. To determine the surface tension of a liquid (water) by Jaeger's method. **(3 hours)**
12. To determine the surface tension of a liquid (water) by Searle's apparatus. **(3 hours)**

Course Outcomes:

Upon completion of the experiments students will develop understanding to:

- Elasticity and modulus of elasticity.
- concept of resonance and its application
- C.G. and its importance in different engineering problems

Examination Scheme:

Components	A	CT	S/V/Q/HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

WORKSHOP/MANUFACTURING PRACTICES LAB

Course Code: BTCE 222

Credit Units: 02
Total Hours: 40

List of experiments/demonstrations:

1. Machine shop **(4 hours)**
2. Fitting shop **(4 hours)**
3. Carpentry **(4 hours)**
4. Electrical & Electronics**(6 hours)**
5. Welding shop **(8 hours) (Arc welding 4 hrs + gas welding 4 hrs)**
6. Casting **(4 hours)**
7. Smithy **(4 hours)**
8. Plastic moulding & Glass Cutting **(6 hours)**

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Laboratory Outcomes:

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

Examination Scheme:

Components	A	CT	S/V/Q/HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

ENVIRONMENTAL STUDIES-II

Course Code: BTCE-242

Credit Units: 02
Total Hours: 20

Course Objectives –

- To understand various types of environmental pollution.
- To educate masses, in general and students, in particular about the issues related to degradation of environment and also social issues related to environment.
- To understand sustainable development.
- To understand environmental assets, local flora and fauna through field surveys.

Module I: Environmental Pollution (7 Hours)
Definition, causes, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear pollution, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management: floods, earthquake, cyclone and landslides.

Module II: Social Issues and the Environment (7 Hours)
From unsustainable to sustainable development, Urban problems and related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns Case studies. Environmental ethics: Issues and possible solutions Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear Accidents and Holocaust case studies. Fireworks/Crackers – Introduction, ill effects on environment and humans.

Wasteland reclamation, Consumerism and waste products, Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act Issues involved in enforcement of environmental legislation Public awareness

Module III: Human Population and the Environment (5 Hours)
Population growth, variation among nations, Population explosion – Family Welfare Programmes
Environment and human health, Human Rights, Value Education, HIV / AIDS, Women and Child Welfare, Role of Information Technology in Environment and Human Health, Case Studies

Module IV: Field Work (1 Hour)
Visit to a local area to document environmental assets-river / forest/ grassland/ hill/ mountain. Visit to a local polluted site – Urban / Rural / Industrial / Agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

Learning Outcomes – Upon course completion, students will be able to:
Explain various types of environmental pollutions. Understand role of individual in abatement of environmental pollution. Explain methods to mitigate disasters. Learn various environmental protection laws. Learn role of IT in environment and human health

Examination Scheme:

Components	CT	HA	S/V/Q	A	ESE
Weightage (%)	15	10	20	5	50

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Text & References:

- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380 013, India, Email:mapin@icenet.net (R)
- De A.K., Environmental Chemistry, Wiley Eastern Ltd. Down to Earth, Centre for Science and Environment (R)
- Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)

Course Outcomes:

Through this course,

- Students will get aware of their personality through the use of various tests, and utilize this information to apply in everyday life events.
- The knowledge of socialization process will help students identify the source of their behavior patterns and help them change destructive and problematic behaviors.
- Students will learn to appreciate the diversity in human nature and bring it to their benefit at a workplace situation.
- Students will learn about the societal and national identities, and be able to shape their goals in accordance with such knowledge.

Examination Scheme:

Components	SAP	A	Mid Term Test (CT)	VIVA	Journal for Success (JOS)
Weightage (%)	20	05	20	30	25

Suggested Readings:

- Davis, K. Organizational Behaviour,
- Bates, A. P. and Julian, J.: Sociology - Understanding Social Behaviour
- Dressler, David and Cans, Donald: The Study of Human Interaction
- Lapiere, Richard. T – Social Change
- Lindzey, G. and Borgatta, E: Sociometric Measurement in the Handbook of Social Psychology, Addison – Welsley, US.
- Rose, G.: Oxford Textbook of Public Health, Vol.4, 1985.
- Robbins O.B.Stephen;. Organizational Behaviour

AMITY UNIVERSITY

MADHYA PRADESH

(Established by Ritnand Balved Education Foundation)

Date: 05/01/2018

BOARD OF STUDIES (Electronics & Communication Engineering)
MINUTES OF THE MEETING
(05 Pages Only)

1. A meeting of board of studies of Department of Electronics & Communication, Amity School of Engineering & Technology, Amity University Madhya Pradesh was held on 5th January 2018 at AUMP, under the Chairmanship of Maj Gen (Dr) S C Jain VSM **(Retd), Director (ASET). The following members attended the meeting:-

   (a) **Chairman:** Maj Gen (Dr) S C Jain VSM **(Retd), Director (ASET)

   (b) **Member**

   i) Dr. Aditya Trivedi, Professor, ABV-IIITM, Gwalior, External Member

   ii) Dr. Raghavendra Sharma, Professor & Head ECE, Member

   iii) Mrs. Rinkoo Bhatia, Assistant Professor, ECE, Member

   iv) Dr. Vivek Singh Kushwah, Assistant Professor, ECE, Member

2. The agenda of the meeting included the following:
   (a) Review of existing syllabus and modification if any.
   (b) Discussion on trends and technologies in ECE and consideration of its inclusion in syllabus.
   (c) Any other point with due permission of the Chairperson.

3. Discussions/Comments:

a. (i) Discussion: on Admissions

(ii) Comments: (1) To improve the visibility of the Department, Conferences and Workshops to be organized.

2) Collaboration to be done with Industry for workshops specifically in the fields of VLSI and Communication which are current trends.

b. (i) Discussion: On Student Projects

(ii) Comments: 1) Students to motivated to develop projects pertaining to societal benefits

2) Project selection to be done such that students to get motivated for Entrepreneurship

3) Industry Tie-ups to be done for student projects so that students can do their projects in Industry

c. (i) Discussion: On Placements

(ii) Comments: 1) Experts from Industry to be invited for delivering talks so that a rapport is build for Placements

2) Atleast 20% students to be placed in very good Companies should be the target.

3) Student group to be formed to find Placement Opportunities for ECE students.

4. Recommendations:

B. Tech Program:

i. Industrial Visit is added as one additional module in BTE-303 of III Semester, BTE-503 of V Semester and BTE-701 of VII semester respectively. This addition is for better exposure about Industry to the students.**(Annexure-1)**

ii. The two subjects Digital Circuits & Systems-I (BTE-401) of 4 credits and Digital Circuits & Systems-II (BTE-501) of 4 credits are merged and new subject with the name Digital Circuits & Systems (BTE-401) of 4 credits is proposed in IV semester. **(Annexure-2)**

iii. The two subjects Digital Circuits & Systems Lab -I (BTE-420) of 1 credit and Digital Circuits & Systems Lab-II (BTE-520) of 1 credit are merged and new subject with the name Digital Circuits & Systems Lab (BTE-420) of 1 credit is proposed in IV semester. **(Annexure-3)**

iv. The subject Data Structures of 3 credits (BTE-501) along with Lab of 01 credit (BTE-520) is added as it is important from placement point of view for ECE students.**(Annexure-4)**

v. The syllabus of the subject code BTE 601, VLSI Design is revised; Basic information about VLSI is missing hence introduced in Module 1and some new topics are added in other modules. The new syllabus is proposed with better elaboration of the topics. **(Annexure-5)**

vi. The subject VHDL Programming (BTE-811) along with VHDL Programming Lab (BTE-830) is added in basket of electives in VIII semester. **(Annexure-6)**

M. Tech Program:

There is no change in the scheme and syllabus of the course.

CBCS:

vii. **Consumer Electronics** is added and the syllabus for all 6 semesters is designed to make it interesting for students of other branches.**(Annexure-7)**

viii. The credits and syllabus of old CBCS subjects are modified. **(Annexure-8)**

All the aforesaid points have been approved by all the board members present in the meeting.

5. Summary of changes is given below:-

Current Syllabus B.Tech (ECE)					Proposed Changes/Modifications (addition/deletion in the Syllabus)	New Course Code B.Tech (ECE)	No. of Credits
Sr. No.	Course Title	Module of the syllabus	Old Course Code	No. of Credits			
1					Additional module of Industrial visit is added in III, V and VII semester without any change in syllabus and credits	BTE-303, BTE-503, BTE-701	
2	Digital Circuits & Systems-I and Digital Circuits & Systems-II are merged	All modules	BTE-401 & BTE-501	4 & 4	Digital Circuits & Systems	BTE-401	4
3	Digital Circuits & Systems Lab-I and Digital Circuits & Systems Lab-II are merged	All modules	BTE-420 & BTE-520	1 & 1	Digital Circuits & Systems Lab	BTE-420	1
4					Data Structures is added	BTE-501	3
5					Data Structures Lab is added	BTE-520	1
6	VLSI Design	All	BTE-601	4	Few modules are rearranged	BTE-601	4
7					VHDL Programming is added in elective list of VIII sem	BTE-811	3
8					VHDL Programming Lab is added in elective list of VIII sem	BTE-830	1
9					Consumer Electronics is added in CBCS		3
Total Credits =**14**					Total Credits=**13**		

The total number of credits after revision for B. Tech works out to **13** credits as against **14** credits, and the credits for M. Tech. remains same.

Signature of Members:

Mrs. Rinkoo Bhatia
Member

Dr. V S Kushwah
Member

Dr. Raghavendra Sharma
Member

Dr. Aditya Trivedi
External Member

Maj Gen (Dr) S C Jain
Chairman- BOS

Prof.(Dr.) M.P. Kaushik
Hon'ble Pro Vice Chancellor
AUMP, Gwalior

APPROVED BY

17/3/18

Hon'ble Vice Chancellor
AUMP, Gwalior

MAE BoS 2018

AMITY UNIVERSITY
MADHYA PRADESH
(Established by Ritnand Balved Education Foundation)

NOTE- SHEET **Date: 31-08-18**

1. **AICTE** syllabus has been adopted for first year Mechanical Engineering.
2. As per revised scheme of ME first semester, following subjects allocated **one credit**.
   a. Engineering Graphics (BTM/BTCE-104)
   b. Workshop/Manufacturing (BTC/BTCE/BTI-104)
3. It is proposed that End semester examinations of above subjects may be scheduled for **One hour** only.

This note sheet is submitted to you for your kind consideration and necessary approval, please.

HoD
ME, ASET

HoI
ASET, AUMP 31/8 "Recommended"

Pro-Vice Chancellor 05/09/18

Director ASET: Pl discuss on phone. MM

Hon'ble Vice Chancellor

As directed, all ~~ESE~~ such exams will be 1½ h only.

SoE

HoD MAE

Date: 09/03/2018

BOARD OF STUDIES (MECHANICAL ENGINEERING AND MECHANICAL & AUTOMATION ENGINEERING)
MINUTES OF THE MEETING
(07 Pages Only)

1. A meeting of board of studies of Department of Mechanical & Automation Engineering, Amity School of Engineering & Technology, Amity University Madhya Pradesh was held on 9th March 2018 at AUMP, under the Chairmanship of Maj Gen (Dr) SC Jain, VSM** (Retd), Director (ASET). The following members attended the meeting:-

   (a) Chairman: Maj Gen (Dr) SC Jain, VSM** (Retd), Director (ASET)

   (b) Member

   i) Dr. Chaitanya Sharma, Associate Professor (ME), RJIT Gwalior.

   ii) Mr. Nasir Khan, Assistant Professor, MAE, ASET.

   iii) Dr. Abhishek Sharma, Assistant Professor, MAE, ASET.

   iv) Dr. Moon Banerjee, Assistant Professor, MAE, ASET.

   v) Mr. Nagendra Kumar Sharma, Assistant Professor, MAE, ASET.

2. The agenda of the meeting included the following:
   (a) Review of existing syllabus and modification if any.
   (b) Discussion on trends and technologies in MAE and consideration of its inclusion in syllabus.
   (c) Any other point with due permission of the Chairperson.

3. Discussions/Comments:

a. (i) Discussion: About Placements of MAE department

(ii) Comments: 1) Aptitude & Reasoning should be the Part of Curriculum.
2) Student Internship Programme should be arranged in Core Companies with focus on Placem
3) Expert from Industries should be Called for better Industry linkage.

b. (i) Discussion: On Student Projects

(ii) Comments: 1) Student should be Motivated to solve Industrial Problems during their SIPs.
2) Student should be Motivated to do Projec on Interdisciplinary so that overall knowledge of Stu Could be enhanced.

c. (i) Discussion: On Admission

(ii) Comments: 1) To improve the visibility of MAE department, Conferences/workshops to be arranged.
2) Young Talent of Gwalior City is to be attracted by organizing Sports & Co-curricular activities in the university.
3) Projects made by MAE Students should be a Part of Exhibition.

4. Recommendations:

B. Tech Program:

i. The syllabus of the subject code BTM-303 (Mechanics of Solids), BTM 401 (Kinematics & Dynamics of machines) & BTM 602(Machine Design-II) are reshuffled within the modules and content is same (Refer Annexure-I).

ii. The syllabus of the subject code BTM-305, Mechanics of Fluids is revised & Industrial visit has been added. (Refer Annexure-II).

iii. The syllabus of the subject code BTM-402, Heat & Mass Transfer is revised. (Refer Annexure-III).

iv. The syllabus of the subject code BTM-601, Management of Manufacturing Systems is revised. (Refer Annexure-IV).

v. The syllabus of the subject code BTM-701, Industrial Engineering & Operation Research is revised & Industrial visit has been added. (Refer Annexure-V).

vi. The syllabus of the subject code BTM-802, Refrigeration & Air Conditioning is revised. (Refer Annexure-VI).

vii. Industrial visit has been added in subject BTM-501(Refer Annexure-VII).

M. Tech Program:

There is no change in the scheme and syllabus of the course.

CBCS:

I. The syllabus of the subject code RT-4603, Automatic Control Systems is replaced by "Modern Material Handling System": as per old syllabus of CBCS no subject can give knowledge to the student about the application of robotics in the industry. The proposed syllabus is focusing on various material handling systems which are widely used in the industries like Automobiles, food processing chemicals, pharmaceuticals etc. Since the students have a subject "Project on Robotics" (MRB 600) so this subject will give the idea about the innovative projects (Refer Annexure-VIII).

II. The credits of the Subject Microprocessor & Microcontroller & Artificial Intelligence are revised from 3 to 4 credits (Refer Annexure-IX).

III. The credits of the Subject Project on Robotics are revised from 3 to 1 credit (Refer Annexure-X).

Ph. D:

There is no change in the scheme and syllabus of the course.

There is no change in the scheme and syllabus of the course.

5. Summary of changes is given below:-

Current Syllabus B.Tech (MAE)					Proposed Changes/Modifications (addition/deletion in the Syllabus)	New Course Code B.Tech (MAE)	No. of Credits
Sr. No.	Course Title	Module of the syllabus	Old Course Code	No. of Credits			
1	Mechanics of Solids	All	BTM-303	3	Updated and systematically arranged entire syllabus(Refer Annexure-I)	BTM-303	3
2	Kinematics & Dynamics of Machines	All	BTM-401	3	Updated and systematically arranged entire syllabus (Refer Annexure-I)	BTM-401	3
3	Machine Design-II	All	BTM-602	3	Updated and systematically arranged entire syllabus (Refer Annexure-I)	BTM-602	3
4	Mechanics of Fluids	All	BTM-305	3	Addition in the Module III & IV and Industrial visit (Refer Annexure-II)	BTM-305	3
5	Heat & Mass Transfer	All	BTM-402	3	Addition in the Module I, III & IV (Refer Annexure-III)	BTM-402	3
6	Management of Manufacturing Systems	All	BTM-601	3	Deletion of the Module VI (Refer Annexure-IV)	BTM-601	3
7	Industrial Engineering & Operation Research	All	BTM-701	3	Modification in the Module VI & Additional module of Industrial visit (Refer Annexure-V)	BTM-701	3
8	Refrigeration & Air Conditioning	All	BTM-802	3	Addition in the Module I & III (Refer Annexure-VI)	BTM-802	3
9	Machine Design-I		BTM-501,	3	Additional module of Industrial visit is added in V Sem without any change in syllabus(Refer Annexure-VII)	BTM-501	3
				Total Credits =24			Total Credits=24

Current Syllabus CBCS (ROBOTICS)					Proposed Changes/Modifications (addition/deletion in the Syllabus)	New Course Code B.Tech (MAE)	No. of Credits
Sr. No.	Course Title	Module of the syllabus	Old Course Code	No. of Credits			
1	Automatic Control System	All	RT 4603	3	Introducing New Paper MMHS in place of ACS (Refer Annexure-VIII)	RT 4603	3
2	Microprocessor & Microcontroller	All	RT 4604	3	Reallocation of credits (Refer Annexure-IX)	RT 4604	4
3	Artificial Intelligence	All	RT 4605	3	Reallocation of credits (Refer Annexure-IX)	RT 4605	4
4	Project on Robotics	All	RT 4606	3	Reallocation of credits (Refer Annexure-X)	RT 4606	1
				Total Credits =12			Total Credits=12

The total number of credits after revision for B. Tech, M.Tech, CBCS and Ph. D. remains same.

Signature of Members:

Maj Gen (Dr) SC Jain, VSM (Retd)**
Chairman- BOS

Dr. Chaitanya Sharma
External Member-BoS

Mr. Nasir Khan
Member- BoS

Dr. Abhishek Sharma
Member-BoS

Dr. Moon Banerjee
Member- BoS

Mr. Nagendra Kr. Sharma
Member-BoS

Prof.(Dr) M.P. Kaushik
Hon'ble Pro Vice Chancellor
AUMP, Gwalior

1/3/18

APPROVED BY
Hon'ble Vice Chancellor
AUMP, Gwalior

AMITY UNIVERSITY
MADHYA PRADESH
(Established by Ritnand Balved Education Foundation)

MEETING OF BOARD OF STUDIES (BOS)
(Mechanical & Automation Engineering)
Amity School of Engineering & Technology

Remarks & Suggestions by BOS Members

1) The Student should Perform failure analysis of designed M/c Component using Software like FEM

2) Modern material like Composites, Carbon nano tubes. Smart materials as well as topic on Corrosion, failure of materials should be included in Mat. Science Syllabus

3) There is a need of Re-structuring the entire syllabus of Manufacturing Torture topics like rapid Prototype, additive manufacturing, hybrid Manufacturing etc. should be included.

Signature of Members:

Maj Gen (Dr) SC Jain, VSM (Retd)**	**Dr. Chaitanya Sharma**	**Mr. Nasir Khan**
Chairman- BOS	External Member-BoS	Member- BoS
Dr. Abhishek Sharma	**Dr. Moon Banerjee**	**Mr. Nagendra Kr. Sharma**
Member-BoS	Member- BoS	Member-BoS

AMITY UNIVERSITY
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MEETING OF BOARD OF STUDIES (BOS)
(Mechanical & Automation Engineering)
Amity School of Engineering & Technology

Remarks & Suggestions by BOS Members

4) The entire manufacturing can be divided into 4 subjects which should cover all major aspects in detail.

5) The subject listen in I sem Element of Mechanical Engg. should be withdrawn as student will study these topic in detail in subsequent semester.

6) It is felt that the separate Syllabus should be designed keeping in view the future requirement of Mechanical Engg. and Mechanical & Automation Engg.

Signature of Members:

Maj Gen (Dr) SC Jain, VSM (Retd)**	**Dr. Chaitanya Sharma**	**Mr. Nasir Khan**
Chairman- BOS	External Member-BoS	Member- BoS
Dr. Abhishek Sharma	**Dr. Moon Banerjee**	**Mr. Nagendra Kr. Sharma**
Member-BoS	Member- BoS	Member-BoS

MECHANICS OF SOLIDS

Course Code: BTM 303 **Credit Units: 03**

Course Objective:

The objective of this course is to make the students understand the concept of stress and strain in different types of structure/machine under different loading conditions. The course also covers the simple and compound stresses due to forces, stresses and deflection in beams due to bending, torsion in circular section, strain energy, different theories of failure, stress in thin cylinder thick cylinder and spheres due to external and internal pressure.

Course Contents:

Module I: Simple stresses and strains
Concept of stress and strain; Hooke's law, Young's modulus, Poisson ratio, stress at a point, stress and strains in bars subjected to axial loading. Modulus of elasticity, stress produced in compound bars subject to axial loading. Temperature stress and strain calculations due to applications of axial loads and variation of temperature in single and compound walls.

Module II: Compound stress and strains
The two dimensional system; stress at a point on a plane, principal stresses and principal planes; Mohr's circle of stress. Graphical and Analytical methods for stresses on oblique section of body. Shear force and bending moment diagrams for cantilever, simply supported and overhanging beams.

Module III: Bending Stress
Theory of bending stresses in beams due to bending, assumptions in the simple bending theory, derivation of formula: its application to beams of rectangular, circular and channel sections, composite / flitched beams, bending and shear stresses in composite beams.

Module IV: Torsion
Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts torsional rigidity, combined torsion and bending of circular shafts principal stress and maximum shear stresses under combined loading of bending and torsion, analysis of close-coiled-helical springs.

Module V: Thin cylinders and spheres
Derivation of formulae and calculation of hoop stress, longitudinal stress in a cylinder and sphere subjected to internal pressure.

Module VI: Columns and struts
Columns and failure of columns, Euler's formulas; Rankine-Gordon's formula, Johnson's empirical formula for axially loaded columns and their applications.

Module VII: Slope and deflection
Relationship between moment, slope and deflection, Mohr's theorem; Moment area method; method of integration; Macaulay's method: Use of all these methods to calculate slope and deflection for the following:
a) Cantilevers
b) Simply supported beams with or without overhang
c) Under concentrated loads, uniformly distributed loads or combination of concentrated and uniformly distributed loads

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Jindal U.C., "Strength of Materials", Galgotia Publication, New Delhi, 1998.
- Ryder G.H., "Strength of Materials", Macmillan, Delhi, 2003.
- R.K. Bansal, "Strength of Materials", Laxmi Publication, New Delhi, 2001.

References:

- Sadhu Singh, "Strength of Materials", Khanna Publishers, New Delhi, 2000.
- Timoshenko S.P., "Elements of Strength of Materials", East-West affiliated, New Delhi, 2000.
- Hibbler R.C., "Mechanics of Materials", Prentice Hall, New Delhi, 1994.
- Popov Eger P., "Engg. Mechanics of solids", Prentice Hall, New Delhi, 1998.
- Fenner, Roger. T, "Mechanics of Solids", U.K. B.C. Publication, New Delhi, 1990.
- Srinath L.S. et.al., "Strength of Materials", McMillan, New Delhi,2001

KINEMATICS AND DYNAMICS OF MACHINES

Course Code: BTM 401 **Credit Units: 03**

Course Objective:

The objective of this course is to identify the alternatives to satisfy the needs of the customer and to quantify and evaluate the alternatives. It includes an introduction to the study of motion of constrained mechanism in machine systems. The objective is to develop the students understanding of basic machine design. Concepts, such as linkages, cams, sliders, crank and rocker, offset crank slider etc. The combination of several of these elements in machine drive trains and the resulting static and dynamic forces will also be studied. This course also includes study of forces, motion and inertia in machines, analysis of linkages, cams, rotor dynamics, reciprocal and rotational balancing.

Course Contents:

Module I: General Concepts, Velocity and Acceleration Analysis
Introduction to simple mechanisms, different types of kinematics pairs, Grubler's rule for degrees of freedom, Grashof's criterion for mobility determination, Inversions of 3R-P, 2R-2P chains, Kinematics analysis of planar mechanism. Instantaneous center method for analysis three center in line theorem, concept of rotating reference frame and its application for Corioli's acceleration

Module II: Cams
Classification, Cams with uniform acceleration and retardation, SHM, Cylcloidal motion, oscillating followers.

Module III: Gears
Geometry of tooth profiles, Law of gearing, involutes profile, interference, helical, spiral and worm gears, simple, compound gear trains. Epicyclic gear trains – Analysis by tabular and relative velocity method, fixing torque.

Module IV: Vibrations5
Vibration analysis of SDOF systems, natural, damped, forced vibrations, base-excited vibrations, transmissibility ratio.

Module V: Dynamic Analysis
Slider-crank mechanism, turning moment computation
Balancing: Static and dynamic balancing, balancing of revolving and reciprocating masses, single and multi-cylinder engines.

Module VI: Gyroscopes
Gyroscopic law, effect of gyroscopic couple on automobiles, ships, aircrafts.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- PL Ballaney, Theory of Machines,
- Hams Crone and Roggers, Theory of Machines
- Shigley, Theory of Machines
- J. Lal, Theory of Machines
- SS Rattan, Theory of Machines
- Ghosh and Mallick, Mechanisms and Machines, EWP publication.
- R.S. Khurmi, Theory of Machine, S. Chand.

MACHINE DESIGN - II

Course Code: BTM 602 **Credit Units: 03**

Course Objective:

The course aims at developing concepts as to how to analyze mechanical systems and select proper machine elements (bearing, gears, belts, chains). It prepares the students how to design machine element by specifying their type, geometry, material and how to integrate these elements to build a mechanical systems.

Course Contents:

Module I: Mechanical Drives
Selection of transmission, helical, bevel and worm gears, belt and chain drives.

Module II: Friction Clutches & Brakes
Common friction materials, shoe, band, cone and disc brake their characteristics and design, friction clutches.

Module III: Bearings and Lubrication
Types of sliding bearing, materials, type of lubrication, design of sliding bearing, selection and application of rolling bearing, seals.

Module IV
Design of spring, helical spring, Leaf spring

Module V: Engine parts
Piston, connecting rod and crankshaft.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Maleeve Hartman and O.P. Grover, "Machine Design", CBS Publication & Publishers.
- V.B Bhandari, "Machine Design", Tata McGraw Hill.
- P.C. Sharma and D.K Aggarwal., "Machine Design", S.K. Kataria & Sons.

References:

- Mahadevan, "Design Data Book", CBS Publication & Publisher

MECHANICS OF SOLIDS

Course Code: BTM 303 **Credit Units: 03**

Course Objective:

The objective of this course is to make the students understand the concept of stress and strain in different types of structure/machine under different loading conditions. The course also covers the simple and compound stresses due to forces, stresses and deflection in beams due to bending, torsion in circular section, strain energy, different theories of failure, stress in thin cylinder thick cylinder and spheres due to external and internal pressure.

Course Contents:

Module I: Simple stresses and strains

Stress and Strain- Tension and Compression -Thermal Stresses -pure shear –Young's modulus of elasticity, Poisson's ratio, Modulus of rigidity and Bulk modulus - Relation between elastic constants –Stress -strain diagrams for brittle and ductile materials-working stress Strain energy in tension and compression. Stress at a point, stress and strains in bars subjected to axial loading. Stress produced in compound bars subject to axial loading.

Module II: Compound stress and strains

Principal Stresses and Strains: Analysis of Biaxial state of stress with and without shear - Mohr's Circle. Shear Force And Bending Moment: Types of supports-Types of beams –Types of loads –articulated beams -Shear Force and Bending Moment diagrams.

Module III: Bending Stress

Theory of Simple Bending: Assumptions -Bending stresses in beams - Derivation of formula for Efficiency of various cross sections of beams (rectangular, circular and channel sections). Shear Stress Distribution: Flexural shear stress distribution in different cross sections of beams.

Module IV: Torsion

Torsion of Circular cross sections: Theory of pure torsion -transmission of Power in Solid and Hollow circular shafts–Combined bending and torsion.

Module V: Thin cylinders and spheres

Thin and Thick Cylinders: Thin and Thick Cylinders – spherical shells subjected to internal fluid pressure

Module VI: Columns and struts

Columns and struts: column and failure of columns, Euler's formulas.

Module VII: Slope and deflection

Deflection of Beams: Slope and deflection of beams- Double Integration method – Macaulay's method –strain energy method.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

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- Ryder G.H., "Strength of Materials", Macmillan, Delhi, 2003.
- R.K. Bansal, "Strength of Materials", Laxmi Publication, New Delhi, 2001.

References:

- Sadhu Singh, "Strength of Materials", Khanna Publishers, New Delhi, 2000.
- Timoshenko S.P., "Elements of Strength of Materials", East-West affiliated, New Delhi, 2000.
- Hibbler R.C., "Mechanics of Materials", Prentice Hall, New Delhi, 1994.
- Popov Eger P., "Engg. Mechanics of solids", Prentice Hall, New Delhi, 1998.
- Fenner, Roger. T, "Mechanics of Solids", U.K. B.C. Publication, New Delhi, 1990.
- Srinath L.S. et.al., "Strength of Materials", McMillan, New Delhi,2001

KINEMATICS AND DYNAMICS OF MACHINES

Course Code: BTM 401 **Credit Units: 03**

Course Objective:

The objective of this course is to identify the alternatives to satisfy the needs of the customer and to quantify and evaluate the alternatives. It includes an introduction to the study of motion of constrained mechanism in machine systems. The objective is to develop the students understanding of basic machine design. Concepts, such as linkages, cams, sliders, crank and rocker, offset crank slider etc. The combination of several of these elements in machine drive trains and the resulting static and dynamic forces will also be studied. This course also includes study of forces, motion and inertia in machines, analysis of linkages, cams, rotor dynamics, reciprocal and rotational balancing.

Course Contents:

Module I: General Concepts, Velocity and Acceleration Analysis

General Concepts, Velocity and Acceleration Analysis: Introduction to simple mechanisms. Different types of link, joint and kinematics pairs. Grubler's rule for degrees of freedom, Grashof's criterion for mobility determination. Inversions of 3R-P, 2R-2P chains. Kinematics analysis of planar mechanism. Oldham coupling. Universal coupling. Application of Kennedy's theorem.

Module II: Gears

Gears -geometry of tooth profiles, Law of gearing, interference. Helical, spiral and worm gears, simple, compound gear trains. Clutches,

Module III: Dynamic Analysis

Slider-crank mechanism, turning moment computation. Balancing: Static and dynamic balancing, balancing of revolving and reciprocating masses, single and multi-cylinder engine Gyroscopic law, effect of gyroscopic couple on automobiles, ships, aircrafts.

Module IV: Cams

Cam & Follower: Classification- types of CAM and Followers, Cams with uniform acceleration and retardation. SHM, Cylcloidal motion. Design of CAM profile

Module V: Vibrations

Mechanical Vibrations: Free and forced vibrations, analysis and applications of discrete and continuous system of vibration.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- PL Ballaney, Theory of Machines,
- Hams Crone and Roggers, Theory of Machines
- Shigley, Theory of Machines
- J. Lal, Theory of Machines
- SS Rattan, Theory of Machines
- Ghosh and Mallick, Mechanisms and Machines, EWP publication.
- R.S. Khurmi, Theory of Machine, S. Chand.

MACHINE DESIGN - II

Course Code: BTM 602 **Credit Units: 03**

Course Objective:
The course aims at developing concepts as to how to analyze mechanical systems and select proper machine elements (bearing, gears, belts, chains). It prepares the students how to design machine element by specifying their type, geometry, material and how to integrate these elements to build a mechanical systems.

Course Contents:
Module I:

Introduction: Different theories of failure and design based on theories. Design for fatigue, design for creep and design for wear and corrosion.

Module II: Belt and Chain drives

Belt Drives: Types of Belt drives, Flat Belt drives, Velocity ratio, Creep of Belt, Length of open Belt, length of cross belt. Power transmission by belt, Maximum tension in the belt. Types of V belt and Pulleys, advantages and disadvantages of V belt over Flat Belt. Ratio of driving tensions for V belt, Rope drives. Chain drives, advantages and disadvantages of Chain drives.

Module III: Brakes and Clutches Brakes

Types, Design of shoe brakes, and Design of Band and Disc Brakes. Clutches: Types, Plate clutches –design for uniform pressure and wear.

Module IV: Bearings

Design of Bearings: Brief overview of bearings, Design of Fluid Film bearings and Rolling contact bearings. Types of sliding bearing. Materials, type of lubrication, design of sliding bearing. Selection and application of rolling bearing, seals.

Module V: - Gears

Design of Gears: Law of gearing -conjugate action and gear tooth profile-basics Analysis of forces on spur, helical, bevel and worm gears. Design procedure of various gears.

Module VI: - Engine Parts

Design of Engine parts: Design of cylinder and cylinder head, Design of Piston. Design of connecting rod. Design of crankshaft.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- Maleeve Hartman and O.P. Grover, "Machine Design", CBS Publication & Publishers.
- V.B Bhandari, "Machine Design", Tata McGraw Hill.
- P.C. Sharma and D.K Aggarwal., "Machine Design", S.K. Kataria & Sons.

References:

- Mahadevan, "Design Data Book", CBS Publication & Publisher

MECHANICS OF FLUIDS

Course Code: BTM 305 **Credit Units: 03**

Course Objective:

The objective of Fluid Mechanics subject is that students should understand the, properties of fluids, pressure measurement devices, hydraulic forces on surfaces, bouncy and flotation in fluids, kinematics and static behaviour of fluids, dimension and model analysis, laminar and turbulent flow, flow through pipes and orifices, boundary layer theory.

Course Contents:

Module I: Fluid Properties and Fluid Statics
Newtonian and Non-Newtonian Fluids; Viscosity; Incompressible and compressible fluids, compressibility. Forces on plane surfaces, forces on curved surfaces, buoyant forces, and stability of floating bodies, metacentre and metacentre height.

Module II: Kinematics of Fluid Motion
Steady and unsteady flow; uniform and non-uniform flow; Laminar and turbulent flow; streamline, path line and streak line; continuity equation, irrotational and rotational flow, velocity potential and stream function, vortex flow, free and forced vortex.

Module III: Dynamics of Fluid Flow
Euler's equation of motion and its integration to yield Bernoulli's equation, its practical applications – Pilot tube, Venturi meter; steady flow momentum equation, force exerted on a pipe bend.

Module IV: Dimensional Analysis and Principles of Similarity
Buckingham π-Theorem and its applications, Geometric, Kinematics and Dynamic similarity; Dimensionless numbers-Reynolds, Froude, Euler, Mach, Weber Number and their significance.

Module V: Laminar and Turbulent Flow
Reynold's experiment, critical velocity, steady laminar flow through a circular tube, flow between parallel plates. Transition from laminar to turbulent flow, courses of turbulence, velocity distribution law near a solid boundary, velocity distribution in rough pipes, Hazen – Williams's formula.

Module VI: Analysis of Pipe Flow
Energy losses, minor losses in pipe lines, concept of equivalent length, flow between two reservoirs, and multiple pipe systems – in series and parallel, siphon.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- R.K. Bansal, "Fluid Mechanics & Hydraulic Machines", Laxmi Publications (P) Ltd., 2002.
- Gupta, S. C., Fluid Mechanics and Hydraulic Machines, Pearson Education, 2007
- D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", S.K. Kataria & Sons, 2000.

References:

- F. M. White, Introduction to Fluid Mechanics, McGraw Hill
- I.H. Shames, "Mechanics of Fluids", Tata McGraw Hill
- Douglas, J. F., Gasiorek, J.M. and Swaffield, J., Fluid Mechanics, Pearson Education, 4/e, 2006
- V.L. Streeter and E.B. Wylie, "Fluid Mechanics", Tata McGraw Hill
- Massey B S, Mechanics of Fluids, Van Nostrand Reinhold Co

MECHANICS OF FLUIDS

Course Code: **BTM 305** Credit Units: 03

Course Objective:

The objective of Fluid Mechanics subject is that students should understand the, properties of fluids, pressure measurement devices, hydraulic forces on surfaces, bouncy and flotation in fluids, kinematics and static behaviour of fluids, dimension and model analysis, laminar and turbulent flow, flow through pipes and orifices, boundary layer theory.

Course Contents:

Module I: Fluid Properties and Fluid Statics

Review of fluid properties, Newtonian and Non-Newtonian Fluids; Incompressible and compressible fluids, compressibility. Pressure at a point, manometers, Forces on plane surfaces, forces on curved surfaces, buoyant forces, and stability of floating bodies, metacentre and metacentre height.

Module II: Kinematics of Fluid Motion

Steady and unsteady flow; uniform and non-uniform flow; Laminar and turbulent flow; streamline, path line and streak line; continuity equation, irrotational and rotational flow, velocity potential and stream function, vortex flow, free and forced vortex.

Module III: Dynamics of Fluid Flow

Euler's equation of motion and its integration to yield Bernoulli's equation, its practical applications – Pitot tube, Venturi meter, Orificemeter; steady flow momentum equation, force exerted on a pipe bend.

Module IV: Dimensional Analysis and Principles of Similarity

Dimensional analysis, Dimensional homogeneity, Buckingham p-Theorem and its applications, Geometric, Kinematics and Dynamic similarity; Dimensionless numbers- Reynolds, Froude, Euler, Mach, Weber Number and their significance.

Module V: Laminar and Turbulent Flow

Reynold's experiment, critical velocity, steady laminar flow through a circular tube, flow between parallel plates. Transition from laminar to turbulent flow, courses of turbulence, velocity distribution law near a solid boundary, velocity distribution in rough pipes, Hazen – Williams's formula.

Module VI: Analysis of Pipe Flow

Energy losses, minor losses in pipe lines, concept of equivalent length, flow between two reservoirs, and multiple pipe systems – in series and parallel, siphon.

Module VII: Industrial Visit

At least one visit to local industry in the field of Mechanical Engineering.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)		5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: AttendanceModule I: Viscosity Module I: Review of fluid properties , Pressure at a point, manometers.

New topics added

Module III: Orificemeter.

Module IV: Dimensional analysis, Dimensional homogeneity

Justifications

1. These are the basic topics and taught by IIT Delhi and DTU.
2. Viscosity will be covered under the topic of fluid property need not to mention separately.

HEAT AND MASS TRANSFER

Course Code: BTM 402 **Credit Units: 03**

Course Objective:

The main objective of the course to understand the behaviour of thermal systems. To illustrate the development of the governing differential, algebraic and finite difference equations associated with thermal systems. To introduce the possible methods of solution to the governing equation. To investigate the influences of boundary and initial conditions and system parameters on the resulting steady or transient response of the system. To provide the basic tools those are used in thermal system design. To expose students to heat transfer applications in industry.

Course Contents:

Module I

One-dimensional steady-state conduction through homogeneous and composite plane walls, cylinders and spheres, critical thickness of insulation; heat transfer from fins of uniform cross section.

Module II

Concept of hydrodynamic and thermal boundary layers, momentum and energy equation for boundary layers on a flat plate application of dimensional analysis to free and force convection; important dimensionless number.

Module III

Thermal radiation; Kirchoff's law; Planck's distribution law, Wien's displacement law; Stefan-Boltzmann's relation, Configuration factors; radiant interchange between black and grey surfaces; radiation shielding solar radiation.

Module IV

Combined heat transfer analysis; overall heat transfer co-efficient; types of heat exchangers; LMTD methods of heat exchanger design; simple heat exchanger calculations.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- Incropera, F.P. and DeWitt, D.P. (2002). Fundamentals of Heat and Mass Transfer, John Willy & Sons, New York, NY.
- Nag, P.K. (2002). Heat and Mass Transfer, TMH.
- John R.Howell & Richrd O Buckius, Fundamentals of Engg. Thermodynamics, McGraw Hill International.
- Holman, J.P. (1997). Heat Transfer, 9th edition, McGraw-Hill.
- Mills, A.F. (1999). Basic Heat and Mass Transfer. Prentice-Hall.
- Thirumaleshwar, M. (2006). Fundamentals of Heat and Mass Transfer, Pearson education.
- Ghoshdastidar, P.S. (2004). Heat Transfer. Oxford University Press.
- Arora, Domkundwar, S. and Domkundwar, A. (1988). A Course in Heat & Mass Transfer, Dhanpat Rai & Co.

HEAT AND MASS TRANSFER

Course Code: **BTM 402** Credit Units: 03

Course Objective:

The main objective of the course to understand the behaviour of thermal systems. To illustrate the development of the governing differential, algebraic and finite difference equations associated with thermal systems. To introduce the possible methods of solution to the governing equation. To investigate the influences of boundary and initial conditions and system parameters on the resulting steady or transient response of the system. To provide the basic tools those are used in thermal system design. To expose students to heat transfer applications in industry.

Course Contents:

Module I

Conduction, Fourier's law and general conduction equation, One-dimensional steady-state conduction through homogeneous and composite plane walls, cylinders and spheres, critical thickness of insulation; heat transfer from fins of uniform cross section, effectiveness and efficiency of fin.

Module II

Concept of hydrodynamic and thermal boundary layers, momentum and energy equation for boundary layers on a flat plate, application of dimensional analysis to free and force convection; important dimensionless number.

Module III

Thermal radiation; Electromagnetic spectrum, reflectivity, absorptivity, transmissivity, emissivity, emisive power , intensity of radiation, Stefan-Boltzmann's relation, Kirchoff's law; Planck's distribution law, Wien's displacement law; Concept of black and gray body; radiant interchange between black and grey surfaces; Configuration factors radiation shielding solar radiation.

Module IV

Combined heat transfer analysis; overall heat transfer co-efficient; fouling factor; types of heat exchangers, LMTD methods of heat exchanger design; simple heat exchanger calculations.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

New Topics Covered

Module I: Conduction, Fourier's law and general conduction equation, effectiveness and efficiency of fin.

Module III: Electromagnetic spectrum, absorptivity, transmissivity, emissivity, emisive power , intensity of radiation

Module IV : Fouling factor,

Justification

These topics are not in AUMP syllabus but taught by IIT Delhi, DTU and also part of GATE syllabus.

MANAGEMENT OF MANUFACTURING SYSTEMS

Course Code: BTM 601 **Credit Units: 03**

Course Objective:

The overall objective of this course is to provide high caliber engineering students with an in-depth understanding of strategic, tactical and operational issues relating to manufacturing industries worldwide. On completion of the course the students will be equipped with the state-of-the-art concepts, methods, techniques and tools to allow them to contribute towards the competitiveness of manufacturing organizations.

Course Contents:

Module I: Introduction
Production functions, Plant Organization: Principles of organization, Organization structure-line and staff Organization
Plant Location, Layout: Process layout product layout and combination layout – methods of layout, economics of layout.

Module II: Production Planning & Control
Types of products, demand, demand forecasting, marketing strategies, scheduling and control of scheduling, production control.

Module III: Work and method study
Definition and concepts, method study procedures, symbols, advantages, Flow process charts, Motion study, micro motion, SIMO charts, system concepts, classification, analysis techniques.

Module IV: Industrial maintenance
Types, organization for maintenance department, Breakdown and preventive maintenance.

Module V: Inventory control and replacement analysis
Introduction replacement policy and method adopted, EOQ.

Module VI: Management concepts
Development of management principles, scientific management, human relation aspects. Project Management – CPM and PERT.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- S.K. Sharma, "Industrial Engg. & Operation Management", S.K. Kataria & Sons.
- Dr. Ravi Shankar, "Industrial Engg. & Management", Galgotia Publications
- M. Mahajan, "Industrial Engg. & Production Management", Dhanpat Rai & Co.
- J Moore, Manufacturing Management, Prentice Hall
- Buffa, Modern production and operations management, E.S. Wiley eastern.

References:

- Joseph S. Martinich, "Production & Operation Management", John Wiley & Sons.

MANAGEMENT OF MANUFACTURING SYSTEMS

Course Code: **BTM 601** Credit Units: 03

Course Objective:

The overall objective of this course is to provide high caliber engineering students with an in-depth understanding of strategic, tactical and operational issues relating to manufacturing industries worldwide. On completion of the course the students will be equipped with the state-of-the-art concepts, methods, techniques and tools to allow them to contribute towards the competitiveness of manufacturing organizations.

Course Contents:

Module-I

Introduction

Production functions, Plant Organization: Principles of organization, Organization structure-line and staff Organization, Plant Location layout, Process layout product layout and combination layout methods of layout, economics of layout.

Module- II

Production Planning & Control

Types of products, demand, demand forecasting, marketing strategies, scheduling and control of scheduling, production control.

Module –III

Work and method study

Definition and concepts, method study procedures, symbols, advantages, Flow process charts, Motion study, micro motion, SIMO charts, system concepts, classification, analysis techniques.

Module –IV

Industrial maintenance

Definition and concepts of Maintenance, Need of Maintenance Management, Maintenance Policies, Strategies and options in Maintenance management. Types, organization for maintenance department, Breakdown and preventive maintenance.

Module –V

Inventory control and replacement analysis

Purpose of Inventory – Cost related to inventors – Basic EOQ model, Introduction replacement policy and method adopted, ABC Analysis, MRP Analysis.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)		5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- S.K. Sharma, "Industrial Engg. & Operation Management", S.K. Kataria & Sons.
- Dr. Ravi Shankar, "Industrial Engg. & Management", Galgotia Publications
- M. Mahajan, "Industrial Engg. & Production Management", Dhanpat Rai & Co.
- J Moore, Manufacturing Management, Prentice Hall
- Buffa, Modern production and operations management, E.S. Wiley eastern.

References:

- Joseph S. Martinich, "Production & Operation Management", John Wiley & Sons.

Justification:-

1. In BTM 601 of AUMP, the topics of Module-VI mentioned here, have already been covered in the paper code BTM-701.
2. The topics of Module-VI of BTM-601 have already been covered in the paper code BTM-701of AUMP and teaches twice in both the subjects.
3. Some new topics has been introduced.
4. In view of the above it is suggested to exclude Module VI of BTM 601 to BTM-701.

OPERATIONS RESEARCH

Course Code: BTM 701 **Credit Units: 03**

Course Objective:

In a rapidly changing environment an understanding is sought which will facilitate the choice and the implementation of more effective solutions, which, typically, may involve complex interactions among people, materials and money. Organizations may seek a very wide range of operational improvements - for example, greater efficiency, better customer service, higher quality or lower cost. Whatever the business, engineering aim, Operation Research can offer the flexibility and adaptability to provide objective help. This course introduces students to the principles of operational research.

Course Contents:

Module I: Linear Programming
Formulation of problem. Graphical and simplex method for maximization and minimization. Duality theory and sensitivity analysis

Module II: Transportation Models
Stepping stone algorithm, MODI method and Vogel's Approximation Method (VAM) for selfing balanced, unbalanced transportation problems and problems of degeneracy and maximization.

Module III: Assignment Models
Assignment model for maximization and traveling salesman problems, Industrial Problems

Module IV: Queuing Theory
Basic structured, Terminology, classification. Birth and death process. Sequencing: Processing in jobs through machines with the same processing order. Processing of 2 jobs through machines with each having different processing order.

Module V: Network Models
Introduction to PERT and CPM. Fundamental concept of Network models and construction of network diagrams. PERT activity, time estimate. Critical path and project time duration. Probability of completing the project on or before specified time. Float of a activity.

Module VI: Games Theory
Zero Sum two person competitive games, Minimax and maximini principle Arithmetic, algebraic, matrix algebra method,. Solution by dominance, sub game, Graphical and linear programming method.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- HM Wagner, Principles of Operations Research, Prentice Hall
- Heizer, J. & Render B., Operations Management, Pearson Education (8/e), 2006
- PK Gupta and DS Hira, Operations Research, S. Chand & Co.
- Taha, Introduction to Operation Research
- F.S. Hiller and G.I. Libermann, Introduction to Operation Research, Holden Ray.

INDUSTRIAL ENGINEERING & OPERATION RESEARCH

Course Code: BTM 701 **Credit Units: 03**

Course Objectives: In a rapidly changing environment an understanding is sought which will facilitate the choice and the implementation of more effective solutions, which, typically, may involve complex interactions among people, materials and money. Organizations may seek a very wide range of operational improvements - for example, greater efficiency, better customer service, higher quality or lower cost. Whatever the business, engineering aim, Operation Research can offer the flexibility and adaptability to provide objective help. This course introduces students to the principles of operational research.

Module I: Linear Programming

Formulation of problem. Graphical and simplex method for maximization and minimization. Duality theory and sensitivity analysis

Module II: Transportation Models & Assignment Models

Stepping stone algorithm, MODI method and Vogel's Approximation Method (VAM) for selfing balanced, unbalanced transportation problems and problems of degeneracy and maximization. Assignment model for maximization and traveling salesman problems, Industrial Problems

Module III: Queuing Theory

Basic structured, Terminology, classification. Birth and death process. Sequencing: Processing in jobs through machines with the same processing order. Processing of 2 jobs through machines with each having different processing order.

Module IV: Network Models

Introduction to PERT and CPM. Fundamental concept of Network models and construction of network diagrams. PERT activity, time estimate. Critical path and project time duration. Probability of completing the project on or before specified time. Float of a activity.

Module V: Project Management

Gantt chart, milestone char. Network scheduling terminology. Path enumeration, Activity on node & activity on arc network precedence diagrams. Reliability: Concept of reliability, objectives, applications, area of use, use of reliability in industry.

Module VI: Games Theory

Zero Sum two person competitive games, Minimax and maximini principle Arithmetic, algebraic, matrix algebra method,. Solution by dominance, sub game, Graphical and linear programming method.

Module VII: Industrial Visit

At least one visit to local industry in the field of Mechanical Engineering.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

Text:

- PK Gupta and DS Hira, Operations Research, S. Chand & Co.
- Vivek Kumar, Operations Research, Kataria Publications

References:

- HM Wagner, Principles of Operations Research, Prentice Hall
- Heizer, J. & Render B., Operations Management, Pearson Education (8/e), 2006
- Taha, Introduction to Operation Research
- F.S. Hiller and G.I. Libermann, Introduction to Operation Research, Holden Ray.
- Krajewski L J and Ritzman L P, "Operations Management", Pearson Education Asia, Sixth Edition (2004)
- Adam and Ebert "Production and Operation Management" Pearson Education Asia, Fifth Edition (2003)

Justification

1. It is required to introduce industrial engineering in B.Tech (MAE) because it finds its major applications in solving the industrial problem.
2. The industrial engineering is not being taught in AUUP Noida and AUMP, Gwalior.
3. Project Management and reliability is being added because this is the required part of industrial engineering.

REFRIGERATION AND AIR CONDITIONING

Course Code: BTM 802 **Credit Units: 03**

Course Objective:

The aim of this course is to provide the students with the understanding of the basic principles of Refrigeration and Air Conditioning such that they could build simple mathematical models representing the conditioned space and its components used to control environmental conditions. The application of thermodynamics, heat transfer, and fluid mechanics includes an understanding of refrigerants and refrigeration systems, psychometrics, human comfort and air quality, calculation of heating and cooling loads, and heat and mass transfer processes and associated R & AC components and systems.

Course Contents:

Module I: Refrigeration
Air refrigeration systems, air cycle refrigeration of aircraft, various compression refrigeration cycles, basic components of the plant.

Module II
Properties and choice of refrigerants, Eco-friendly refrigerants multiple compression and evaporation system, cascading.

Module III
Vapour absorption cycle, Electrolux system steam jet refrigeration, vortex tube, application of refrigeration systems cascading, vapour absorption cycle.

Module IV: Air-conditioning
Psychometric processes, applied psychometric, comfort air-conditioning, ventilation requirements, cooling and dehumidification system, estimation of cooling and heating loads, air handling, air distribution, duct design, industrial air conditioning.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- CP Arora, Refrigeration and Conditioning, Tata McGraw Hill
- Manohar Prasad, Refrigeration and Conditioning , Wiley Eastern Limited
- Jordan and Priester, Refrigeration and Conditioning, Prentice Hall of India
- WF Stoecker, Refrigeration and Conditioning, McGraw Hill.

REFRIGERATION AND AIR CONDITIONING

Course Code: **BTM 802** Credit Units: 03

Course Objective:

The aim of this course is to provide the students with the understanding of the basic principles of Refrigeration and Air Conditioning such that they could build simple mathematical models representing the conditioned space and its components used to control environmental conditions. The application of thermodynamics, heat transfer, and fluid mechanics includes an understanding of refrigerants and refrigeration systems, psychometrics, human comfort and air quality, calculation of heating and cooling loads, and heat and mass transfer processes and associated R & AC components and systems.

Course Contents:

Module I: Refrigeration
Fundamental of refrigeration, Heat engine, heat pump and refrigerating machine, Coefficient of performance, Basic components of the plant, reversed Carnot cycle, Vapor compression refrigeration system, Effect of operating parameters, Air refrigeration systems, Air cycle refrigeration of aircraft.

Module II
Refrigerants, Types of refrigerants, Properties and choice of refrigerants, Eco-friendly refrigerants multiple compression and evaporation system, cascading.

Module III
Vapour absorption cycle, Electrolux system, Steam jet refrigeration, vortex tube, application of refrigeration systems cascading, vapour absorption cycle.

Module IV: Air-conditioning
Psychometric processes, applied psychometric, comfort air-conditioning, ventilation requirements, cooling and dehumidification system, estimation of cooling and heating loads, air handling, air distribution, duct design, industrial air conditioning.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE	
Weightage (%)		5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance.

Topics Added

Module I: Fundamental of refrigeration, Heat engine, heat pump and refrigerating machine, Coefficient of performance, reversed Carnot cycle, Effect of operating parameters.

Module II: Refrigerants, Types of refrigerants.

Justifications

These topics are not taught in AUMP syllabus but this is important in concern with the GATE syllabus, which will help students. Also, taught in the NITs.

MACHINE DESIGN - I

Course Code: BTM 501 **Credit Units: 03**

Course Objective:

The objective of this course is to help students apply concepts learned in the mechanics, structure, material and manufacturing courses. This course offers working knowledge in the use of proper failure theories under steady and variable loading, design of mechanical elements, such as shaft, coupling, power screws, and detachable, permanent and welded connections.

Course Contents:

Module I: Variable stresses in Machine Parts
Fatigue and Endurance Limit, Factor of Safety for Fatigue Loading, Stress concentration, Notch sensitivity, Gerber Method, Goodman Method and Soderberg Method for combination of stresses.

Module II: Power Screws
Types of screw threads, Torque required to raise and lower the load, Efficiency of square threaded screw, overhauling and self locking screw, stresses in power screw, design of screw jeck.

Module III: Cotter and Knuckle Joints
Types of cotter joints, design of socket and spigot joint, design of sleeve and cotter joint, design of jib and cotter joint, Design procedure of Knuckle joint.

Module IV: Riveted and Welded Joint
Types of Riveted joint, Lap joint , Butt Joint, Caulking and Fullering, Failure of Riveted joint, Strength of Riveted joint, Efficiency of Riveted joint. Advantages and Disadvantages of welded joint over Riveted joint, Strength of Fillet joint, strength of Butt joints.

Module V: Keys and Couplings
Types of Keys, Splines, Strength of Sunk Key, types of shaft coupling, Sleeve and muff coupling, Flange coupling, Flexible coupling, Oldham coupling, Universal coupling.

Module VI: Drives
Types of Belt drives, Flat Belt drives, Velocity ratio, Sleep, Creep of Belt, Length of open Belt, length of cross belt, power transmission by belt, Maximum tesion in the belt. Types of V belt and Pulleys, advantages and disadvantages of V belt over Flat Belt, Ratio of Driving tensions for V belt, Rope drives. Chain drives, advantages and disadvantages of Chain drives.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- J.E. Shigley, Mechanical Engineering Design.
- Sadhu Singh, Machine Design
- R.S. Khurmi & J.K. Gupta, Machine design
- D.K. Aggarwal & P.C. Sharma, Machine Design

MACHINE DESIGN - I

Course Code: BTM 501 **Credit Units: 03**

Course Objective:

The objective of this course is to help students apply concepts learned in the mechanics, structure, material and manufacturing courses. This course offers working knowledge in the use of proper failure theories under steady and variable loading, design of mechanical elements, such as shaft, coupling, power screws, and detachable, permanent and welded connections.

Course Contents:

Module I: Variable stresses in Machine Parts
Fatigue and Endurance Limit, Factor of Safety for Fatigue Loading, Stress concentration, Notch sensitivity, Gerber Method, Goodman Method and Soderberg Method for combination of stresses.

Module II: Power Screws
Types of screw threads, Torque required to raise and lower the load, Efficiency of square threaded screw, overhauling and self locking screw, stresses in power screw, design of screw jeck.

Module III: Cotter and Knuckle Joints
Types of cotter joints, design of socket and spigot joint, design of sleeve and cotter joint, design of jib and cotter joint, Design procedure of Knuckle joint.

Module IV: Riveted and Welded Joint
Types of Riveted joint, Lap joint , Butt Joint, Caulking and Fullering, Failure of Riveted joint, Strength of Riveted joint, Efficiency of Riveted joint, Advantages and Disadvantages of welded joint over Riveted joint, Strength of Fillet joint, strength of Butt joints.

Module V: Keys and Couplings
Types of Keys, Splines, Strength of Sunk Key, types of shaft coupling, Sleeve and muff coupling, Flange coupling, Flexible coupling, Oldham coupling, Universal coupling.

Module VI: Drives
Types of Belt drives, Flat Belt drives, Velocity ratio, Sleep, Creep of Belt, Length of open Belt, length of cross belt, power transmission by belt, Maximum tesion in the belt. Types of V belt and Pulleys, advantages and disadvantages of V belt over Flat Belt, Ratio of Driving tensions for V belt, Rope drives. Chain drives, advantages and disadvantages of Chain drives.

Module VII: Industrial Visit
At least one visit to local industry in the field of Mechanical Engineering.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; Att: Attendance

Text & References:

- J.E. Shigley, Mechanical Engineering Design.
- Sadhu Singh, Machine Design
- R.S. Khurmi & J.K. Gupta, Machine design
- D.K. Aggarwal & P.C. Sharma, Machine Design

(Syllabus to be replaced)

AUTOMATIC CONTROL SYSTEMS

Course Code: RT 4603 **Credit Units: 03**

Course Objective:

In this course student will be able to understand the complexity of control systems , Transfer Function Representation of linear systems
Proportional and Integral Controllers The various automatic control systems and their principle as well as technology used in real world.
To study the basics of control system and its response .stability of mechanical and electrical systems . Use of MATLAB to design a stable control system.

UNIT – I, INTRODUCTION : Open loop and closed loop systems - Examples - Elements of closed loop systems - Transfer function of elements - Modeling of physical systems - Mechanical systems - Translational and Rotational systems - Electrical networks - Analog circuits Thermal & Hydraulic systems – Block diagram.

UNIT – II, TRANSFER FUNCTION: Transfer function - Transfer function of DC generator, DC servomotor, AC servomotor - Transfer function of potentiometer, Synchro, Tacho-generator, Stepper motor.

UNIT – III, TIME DOMAIN ANALYSIS: Standard Test signals – Time response of second order system - Time domain response Performance criteria - Types of systems - Steady state error constants - Generalised error series - Feedback characteristics of control systems introduction to PID Controllers

UNIT – IV, STATE SPACE ANALYSIS: Introduction to state space analysis - Phase variable and canonical forms - State transition matrix - Solutions to state space equation - Discretisation of state space equation - Controllability and Observability of systems.

UNIT – V, FREQUENCY RESPONSE OF SYSTEMS: Frequency domain specifications - peak resonance, resonant frequency, bandwidth and cut-off rate - Estimation for second order systems - correlation between time and frequency response for second order systems.

Examination Scheme:

Components	Att	Mid Sem	HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment, EE: End Semester Examination; Att: Attendance

Refrences:

1. Patranabis D:" Sensor & Actuators", Prentice Hall of India (Pvt) Ltd, 2005
2. Renganathan S, "Transducer Engineering:, Allied Publishers (P) Ltd., 2003
3. Ernest O. Deoblin, "Measurment System, Application & Design", Tata McGraw Hill Publishing Company Ltd, Fifteth Edition, 2004
4. Bolton W, Mechatronics, Thomson Press, 2003
5. John P. Bentley, " Principles of Measurment Systems,", 3ed Edition, Pearson Education, 2000

(Proposed Syllabus)

MODERN MATERIAL HANDLING SYSTEM

Course Code: RT 4603 **Credit Units: 03**

Course Objective:

In this course student will be able to understand the complexity of material handling systems. AGV's AS/RS system, conveyor systems,storage systems and Application of Robotics in material handling r Function Representation of linear systems
Proportional and Integral Controllers The various automatic control systems and their principle as well as technology used in real world.
To study the basics of control system and its response .stability of mechanical and electrical systems . Use of MATLAB to design a stable control system.

UNIT I-INTRODUCTION

Material Handling – Functions, Types, analysis, Importance & Scope, Principles, - Part feeding device – types of material handling system – Unit material movement & Unit loads – Receiving, Shipping, inprocess handling bulk handling equipment & methods.

UNIT II-MATERIAL HANDLING EQUIPMENT

Industrial trucks, lifting device, monorails, manipulators, conveyors, storage systems, elevators, racks, bins, pallets, cranes – Automation of material handling – mechanization of part handling.

UNIT III-AUTOMATED GUIDED VEHICLE SYSTEM

Types of AGV's – Guidance techniques – Painted line, wire guided, vision guided method – Applications – Vehicle guidance & routing – Traffic control & safety – system management – Quantitative analysis of AGV system.

UNIT IV-STORAGE SYSTEM

Conveyor systems – types, Quantitative relationship & analysis – Automated storage system, performance – AS/RS system – Basic components, types, controls, features, applications, Quantitative analysis – carousel storage system – applications.

UNIT V-ROBOTICS IN MATERIAL HANDLING

General considerations in robot material handling – material transfer application – pick & place operations – machine loading & unloading –characteristics of robot application – Robot cell design – processing

operations – Spot welding, Spray painting, Plastic moulding, forging.

Examination Scheme:

Components	Att	Mid Sem	HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment, EE: End Semester Examination; Att: Attendance

Refrences:

1. Mikell P. Groover, Automated Production system & computer integrated manufacturing — Prentice Hall of India – 1987.
2. Mikell P Groover, Industrial Robotics –McGraw Hill – 1986
3. Allegeri, Theodove . H, Material Handling Principle & Pratice – C.B.S.Publisher – 1987.
4. Alexandrov .M.P & Rudenko .N, Material handling equipments – MIR Publisher – 1981.
5. Govindan .K.R, Plant Layout & Material Handling – Anuradha agency –2001.
6. Material Handling Equipment for the manufacturing industry – AICTE –1995.
7. Measwani .N.V & Mehta .A.C., Advances in material handling equipment

Justification

After reviewing all the subject of Robotics Program, It was found that there is no subject who can give knowledge to the student about the application of robotics in the industry.

The proposed syllabus is focusing on various material handling systems which are widely used in the industries like Automobiles, food processing chemicals, pharmaceuticals etc.

Since the students have a subject "Project on Robotics" (MRB 600) so this subject will give the idea about the innovative projects

MICROPROCESSOR & MICROCONTROLLER

Course Code: RT 4604 **Credit Units: 04**

Course Objective:

This course deals with the systematic study of the Architecture and programming issues of 8085-microprocessor family. The aim of this course is to give the students basic knowledge of the above microprocessor needed to develop the systems using it.

UNIT – I, ARCHITECTURE OF 16-BIT MICROPROCESSOR

Difference between 8085 and 8086, Block diagram and architecture of 8086 family, pin configuration of 8086, minimum mode & maximum mode Operation, Bus Interface Unit, Register Organization, Instruction Pointer, Stack & Stack pointer, merits of memory segmentation, Execution Unit, Register Organization.

UNIT – II, 8086 Instructions set , addressing modes, programming, application programming

UNIT – III, OVERVIEW OF MICROCONTROLLER: Microcontroller and Embedded Processors, Overview of 8051 Microcontroller family: Architecture, basic assembly language programming concepts, The program Counter and ROM Spaces in the 8051, Data types, 8051 Flag Bits ad PSW Register, 8051 Register Banks and Stack Instruction set, Loop and Jump Instructions, Call Instructions, Time delay generations and calculations, I/O port programming Addressing Modes, accessing memory using various addressing modes, Arithmetic instructions and programs, Logical instructions, BCD and ASCII application programs, Single-bit instruction programming, Reading input pins vs. port Latch, Programming of 8051 Timers, Counter Programming.

UNIT – IV, COMMUNICATION WITH 8051

Basics of Communication, Overview of RS-232, I2C Bus, UART, USB, IEEE 488 (GPIB). Parallel input output applications. (Stepper motor Sequencer program, Strobed input/output). Interrupt driven applications (real time clock, serial input/output with interrupt). Analog-digital interfacing (Pulse width modulator, 8-bit ADC).

UNIT – V, BASICS OF 8051 C PROGRAMMING

Introduction to 8051 C, 8051 memory constitution, Constants, variables and data types. Arrays structures and unions, pointers, Loops and decisions, Functions, Modules and programs.

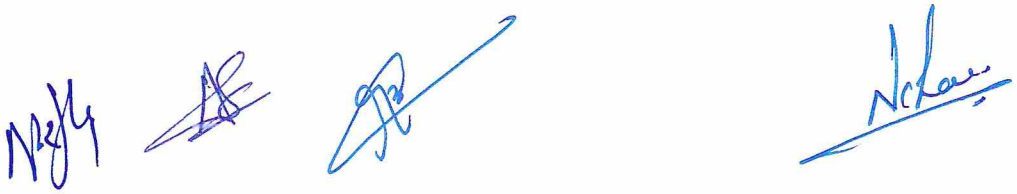
Examination Scheme:

Components	Att	Mid Sem	HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment, EE: End Semester Examination; Att: Attendance

Referencse:

- Raj Kamal, 2004, "Embedded Systems", TMH.
- James W. Stewart and Kai X. Miao, 2en Edition. "The 8051 microcontroller" Pearson Edu. Prentice Hall.
- M.A. Mazidi and J. G. Mazidi, 2004 "The 8051 Microcontroller and Embedded Systems", PHI.
- B. Ram, "Fundamentals of microprocessors and microcomputer" Dhanpat Rai, 5th Edition.]
- Douglas V Hall.
- M. Rafiquzzaman, "Microprocessor Theory and Application" PHI – 10th Indian Reprint.
- Naresh Grover, "Microprocessor comprehensive studies Architecture, Programming and Interfacing" Dhanpat Rai, 2003.



ARTIFICIAL INTELLIGANCE

Course Code: RT 4605 **Credit Units: 04**

Course Objective:

To develop semantic-based and context-aware systems to acquire, organise, process, share and use the knowledge embedded in multimedia content. Research will aim to maximise automation of the complete knowledge lifecycle and achieve semantic interoperability between Web resources and services. The field of Robotics is a multi disciplinary as robots are amazingly complex system comprising mechanical, electrical, electronic H/W and S/W and issues germane to all these.

UNIT – I, PROBLEM SOLVING AND SCOPE OF AI

Introduction to Artificial Intelligence. Applications- Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems. AI techniques- search knowledge, abstraction.

PROBLEM SOLVING

State space search; Production systems, search space control: depth-first, breadth-first search. Heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis.

UNIT – II, KNOWLEDGE REPRESENTATION

Knowledge Representation issues, first order predicate calculus, Horn Clauses, Resolution, Semantic Nets, Frames, Partitioned Nets, Procedural Vs Declarative knowledge, Forward Vs Backward Reasoning.

UNIT – III, UNDERSTANDING NATURAL LANGUAGES

Introduction to NLP, Basics of Syntactic Processing, Basics of Semantic Analysis, Basics of Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Shanks Conceptual Dependency, Scripts, Basics of grammar free analyzers, Basics of sentence generation, and Basics of translation.

UNIT – IV, EXPERT SYSTEM: Need and justification for expert systems, knowledge acquisition, Case studies: MYCIN, RI.

LEARNING: Concept of learning, learning automation, genetic algorithm, learning by inductions, neural nets.

PROGRAMMING LANGUAGE: Introduction to programming Language, LISP and PROLOG.

HANDLING UNCERTAINTIES: Non-monotonic reasoning, Probabilistic reasoning, use of certainty factors, Fuzzy logic.

UNIT – V, INTRODUCTION TO ROBOTICS

Fundamentals of Robotics, Robot Kinematics: Position Analysis, Dynamic Analysis and Forces, Trajectory Planning, Sensors and vision system.

Robot Programming languages & systems: Introduction, the three levels of robot programming, requirements of a robot programming language, problems peculiar to robot programming languages.

Examination Scheme:

Components	Att.	Mid Sem.	HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment EE: End Semester Examination; Att: Attendance

References:

- E. Rich and K. Knight, "Artificial intelligence", TMH, 2nd ed., 1992.
- N.J. Nilsson, "Principles of AI", Narosa Publ. House, 1990.
- John J. Craig, "Introduction to Robotics", Addison Wesley publication
- Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, "Robotic Engineering – An integrated approach", PHI Publication
- Tsuneo Yoshikawa, "Foundations of Robotics", PHI Publication

PROJECTS ON ROBOTICS

Course Code: RT 4606 **Credit Units: 01**

Course Objective:

Students will be applying the skills learned and make models of robots.

Students have to make a project based on subject input of all the previous five semester and evaluation will be done on the basis of innovativeness and usefulness, objectivity, and learning outcome.

Bachelor of Technology

(Mechanical & Automation Engineering)

Programme Code: BTM

Duration – 4 Years Full Time

Programme
Scheme of Examination

2018-19

AMITY UNIVERSITY
MADHYA PRADESH

PROGRAMME STRUCUTRE-B.TECH(MAE)

FIRST SEMESTER

Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits
BTM 101	Applied Mathematics – I	3	-	-	3
BTM 102	Applied Physics - I – Fields & Waves	2	1	-	3
BTM 103	Element of Mechanical Engineering	2	-	-	2
BTM 104	Introduction to Computers & Programming in C	2	1	-	3
BTM 105	Applied Chemistry	2	1	-	3
BTM 106	Environmental Studies – I	2	-	-	2
BTM 120	Applied Physics Lab – I	-	-	2	1
BTM 121	Element of Mechanical Engineering Lab	-	-	2	1
BTM 122	Programming in C Lab	-	-	2	1
BTM 123	Applied Chemistry Lab	-	-	2	1
BTM 124	Engineering Graphics Lab	-	-	2	1
BTM 141	English Language usage essentials	1	-	-	1
BTM 143	Understanding self for effectiveness	1	-	-	1
BTC 144	Foreign Language – I French	2	-	-	2
TOTAL CREDITS					**25**
Including CBCS		3			**28**
Total Hrs Including CBCS					**33**

SECOND SEMESTER					
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**
BTM 201	Applied Mathematics – II	3	-	-	3
BTM 202	Applied Physics - II – Modern Physics	2	1	-	3
BTM 203	Electrical Science	2	1	-	3
BTM 204	Object oriented programming using C++	2	1	-	3
BTM 205	Engineering Mechanics	2	1	-	3
BTM 206	Environmental Studies-II	2	-	-	2
BTM 220	Applied Physics Lab – II	-	-	2	1
BTM 221	Electrical Science Lab	-	-	2	1
BTM 222	Object oriented programming using C++ Lab	-	-	2	1
BTM 223	Engineering Mechanics Lab	-	-	2	1
BTM 240	English	1	-	-	1
BTM 243	Behavioural science - II	1	-	-	1
	Foreign Language - II	2	-	-	2
BTM 244	French				
TOTAL CREDITS					**25**
Including CBCS		3			**28**
Total Hrs Including CBCS					**32**
TERM PAPER DURING SUMMER BREAK					

THIRD SEMESTER

Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits
BTM 301	Numerical Analysis & Programming	2	-	-	2
BTM 302	Thermodynamics	2	1	-	3
BTM 303	Mechanics of Solids	2	1	-	3
BTM 304	Material Science & Metallurgy	2	1	-	3
BTM 305	Mechanics of Fluids	3	-	-	3
BTM 306	Electronics	2	-	-	2
BTM 320	Mechanics of Solids & Fluids Lab	-	-	2	1
BTM 321	Machine Drawing with CAD Lab	-	-	2	1
BTM 322	Programming Lab - I (Numerical Analysis)	-	-	2	1
BTM 323	Electronics Lab	-	-	2	1
BTM 324	Thermodynamics Lab	-	-	2	1
BTM 341	Communication Skills – I	1	-	-	1
BTM 343	Behavioural Science - III	1	-	-	1
	Foreign Language – III	2	-	-	2
BTM 344	French				
BTM 330	Term Paper (Evaluation)	-	-	-	2
TOTAL CREDITS					**27**
Including CBCS		3			**30**
Total Hrs Including CBCS					**33**

FOURTH SEMESTER

Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits
BTM 401	Kinematics & Dynamics of Machines	3	-	-	3
BTM 402	Heat & Mass Transfer	2	1	-	3
BTM 403	Manufacturing Machines	3	-	-	3
BTM 404	Theory of Metal Forming	3	-	-	3
BTM 405	Electrical Machines	3	-	-	3
BTM 406	Principles of Computer Graphics	2	-	-	2
BTM 420	Kinematics & Dynamics of Machines Lab	-	-	2	1
BTM 421	Manufacturing Machines Lab	-	-	2	1
BTM 422	Electrical Machines Lab	-	-	2	1
BTM 423	Principles of Computer Graphics Lab	-	-	2	1
BTM 424	Heat & Mass Transfer Lab	-	-	2	1
BTC 441	Communication Skills - II	1	-	-	1
BTC 443	Behavioural Science - IV	1	-	-	1
	Foreign Language – IV	2	-	-	2
BTC 444	French				
TOTAL CREDITS					**26**
Including CBCS		3	1		**30**
Total Hrs Including CBCS					**35**
PRACTICAL TRAINING – I: 6 – 8 WEEKS					

FIFTH SEMESTER					
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**
BTM 501	Machine Design – I	3	-	-	3
BTM 502	Metrology	3	-	-	3
BTM 503	Measurements & Controls	2	1	-	3
BTM 504	Relational Database Management System	3	-	-	3
BTM 505	Microprocessor System	3	1	-	4
BTM 521	Metrology Lab	-	-	2	1
BTM 522	Measurements & Controls Lab	-	-	2	1
BTM 523	Microprocessor System Lab	-	-	2	1
BTM 524	Programming Lab - II (MAT Lab)	-	-	2	1
BTM 525	Relational Database Management System Lab	-	-	2	1
BTM 541	Communication Skills - III	1	-	-	1
BTM 543	Behavioural Science - V	1	-	-	1
	Foreign Language – V	2	-	-	2
BTM 544	French				
BTM 550	Industrial Practical Training - I (Evaluation)	-	-	-	3
TOTAL CREDITS					**28**
Including CBCS		3	1		**32**
Total Hrs Including CBCS					**34**

SIXTH SEMESTER					
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**
BTM 601	Management of Manufacturing Systems	3	-	-	3
BTM 602	Machine Design – II	3	-	-	3
BTM 603	Fluid Power Systems	2	1	-	3
BTM 604	Metal Cutting & Tool Design	3	-	-	3
BTM 605	IC Engine & Gas Turbine	3	-	-	3
BTM 606	Computer Networks	2	1	-	3
BTM 620	Machine Design Lab - II	-	-	2	1
BTM 621	Fluid Power Systems Lab	-	-	2	1
BTM 622	IC Engine & Gas Turbine Lab	-	-	2	1
BTM 641	Communication Skills - IV	1	-	-	1
BTM 643	Behavioural Science - VI	1	-	-	1
	Foreign Language – VI	2	-	-	2
BTM 644	French				
TOTAL CREDITS					**25**
Including CBCS				1	**26**
Total Hrs Including CBCS					**29**

SEVENTH SEMESTER					
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**
BTM 701	Operations Research	3	-	-	3
BTM 702	Computer Aided Manufacturing	3	-	-	3
BTM 703	Mechatronics	3	-	-	3
BTM 720	Operations Research (Programming) Lab	-	-	2	1
BTM 721	Computer Aided Manufacturing Lab	-	-	2	1
BTM 722	Mechatronics Lab	-	-	2	1
BTM 741	Communication Skills - V	1	-	-	1
BTM 743	Behavioural Science -VII	1	-	-	1
	Foreign Language – VII	2	-	-	2
BTM 744	French				
BTM 750	Practical Training – II(Evaluation)	-	-	-	6
BTM 760	Project (Dissertation)	-	-	-	6
ELECTIVES (Any one from each category)					
A (With Practical)					
BTM 704	Automotive Engineering	3	-	-	3
BTM 705	Computer Aided Designing	3	-	-	3
BTM 723	Automotive Engineering Lab	-	-	2	1
BTM 724	Computer Aided Designing Lab	-	-	2	1
ELECTIVES (Any one from each category)					
B (Without Practical)					
BTM 706	Marketing Management	3	-	-	3
BTM 707	Solar Energy	3	-	-	3
BTM 708	Power Plant Practices	3	-	-	3
BTM 709	Combustion Engine Emissions	3	-	-	3
TOTAL CREDITS					**35**
Total Hrs					**33**

EIGHTH SEMESTER					
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**
BTM 801	Quality Control & Quality Assurance	3	-	-	3
BTM 802	Refrigeration & Air-conditioning	3	-	-	3
BTM 820	Refrigeration & Air-conditioning Lab	-	-	2	1
BTM 841	Communication Skills - VI	1	-	-	1
BTM 843	Behavioural Science - VIII	1	-	-	1
	Foreign Language – VIII	2	-	-	2
BTM 844	French				
BTC 860	Project	-	-	-	9
ELECTIVES (Any one from following with Practical)					
BTM 803	Advanced Methods of Manufacturing	3	-	-	3
BTM 804	Gear Technology	3	-	-	3
BTM 805	Artificial Intelligence & Robotics	3	-	-	3
BTM 821	Advanced Methods of Manufacturing Lab	-	-	2	1
BTM 822	Gear Technology Lab	-	-	2	1
BTM 823	Artificial Intelligence & Robotics Lab	-	-	2	1
TOTAL CREDITS					**24**
Total Hrs.					**26**

Bachelor of Technology

(Mechanical & Automation Engineering)

Programme Code: BTM

Duration – 4 Years Full Time

Programme
Scheme of Examination

2017-18

AMITY UNIVERSITY
MADHYA PRADESH

PROGRAMME STRUCUTRE-B.TECH(MAE)

FIRST SEMESTER

Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits
BTM 101	Applied Mathematics – I	3	-	-	3
BTM 102	Applied Physics - I – Fields & Waves	2	1	-	3
BTM 103	Element of Mechanical Engineering	2	-	-	2
BTM 104	Introduction to Computers & Programming in C	2	1	-	3
BTM 105	Applied Chemistry	2	1	-	3
BTM 106	Environmental Studies – I	2	-	-	2
BTM 120	Applied Physics Lab – I	-	-	2	1
BTM 121	Element of Mechanical Engineering Lab	-	-	2	1
BTM 122	Programming in C Lab	-	-	2	1
BTM 123	Applied Chemistry Lab	-	-	2	1
BTM 124	Engineering Graphics Lab	-	-	2	1
BTM 141	English Language usage essentials	1	-	-	1
BTM 143	Understanding self for effectiveness	1	-	-	1
BTC 144	Foreign Language – I French	2	-	-	2
TOTAL CREDITS					**25**
Including CBCS					**28**
Total Hrs Including CBCS					**33**

SECOND SEMESTER					
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**
BTM 201	Applied Mathematics – II	3	-	-	3
BTM 202	Applied Physics - II – Modern Physics	2	1	-	3
BTM 203	Electrical Science	2	1	-	3
BTM 204	Object oriented programming using C++	2	1	-	3
BTM 205	Engineering Mechanics	2	1	-	3
BTM 206	Environmental Studies-II	2	-	-	2
BTM 220	Applied Physics Lab – II	-	-	2	1
BTM 221	Electrical Science Lab	-	-	2	1
BTM 222	Object oriented programming using C++ Lab	-	-	2	1
BTM 223	Engineering Mechanics Lab	-	-	2	1
BTM 240	English	1	-	-	1
BTM 243	Behavioural science - II	1	-	-	1
	Foreign Language - II	2	-	-	2
BTM 244	French				
TOTAL CREDITS					**25**
Including CBCS					**28**
Total Hrs Including CBCS					**32**
TERM PAPER DURING SUMMER BREAK					

THIRD SEMESTER

Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits
BTM 301	Numerical Analysis & Programming	2	-	-	2
BTM 302	Thermodynamics	2	1	-	3
BTM 303	Mechanics of Solids	2	1	-	3
BTM 304	Material Science & Metallurgy	2	1	-	3
BTM 305	Mechanics of Fluids	3	-	-	3
BTM 306	Electronics	2	-	-	2
BTM 320	Mechanics of Solids & Fluids Lab	-	-	2	1
BTM 321	Machine Drawing with CAD Lab	-	-	2	1
BTM 322	Programming Lab - I (Numerical Analysis)	-	-	2	1
BTM 323	Electronics Lab	-	-	2	1
BTM 324	Thermodynamics Lab	-	-	2	1
BTM 341	Communication Skills – I	1	-	-	1
BTM 343	Behavioural Science - III	1	-	-	1
	Foreign Language – III	2	-	-	2
BTM 344	French				
BTM 330	Term Paper (Evaluation)	-	-	-	2
TOTAL CREDITS					**27**
Including CBCS					**30**
Total Hrs Including CBCS					**33**

FOURTH SEMESTER

Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits
BTM 401	Kinematics & Dynamics of Machines	3	-	-	3
BTM 402	Heat & Mass Transfer	2	1	-	3
BTM 403	Manufacturing Machines	3	-	-	3
BTM 404	Theory of Metal Forming	3	-	-	3
BTM 405	Electrical Machines	3	-	-	3
BTM 406	Principles of Computer Graphics	2	-	-	2
BTM 420	Kinematics & Dynamics of Machines Lab	-	-	2	1
BTM 421	Manufacturing Machines Lab	-	-	2	1
BTM 422	Electrical Machines Lab	-	-	2	1
BTM 423	Principles of Computer Graphics Lab	-	-	2	1
BTM 424	Heat & Mass Transfer Lab	-	-	2	1
BTC 441	Communication Skills - II	1	-	-	1
BTC 443	Behavioural Science - IV	1	-	-	1
	Foreign Language – IV	2	-	-	2
BTC 444	French				
TOTAL CREDITS					**26**
Including CBCS					**29**
Total Hrs Including CBCS					**34**
PRACTICAL TRAINING – I: 6 – 8 WEEKS					

FIFTH SEMESTER					
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**
BTM 501	Machine Design – I	3	-	-	3
BTM 502	Metrology	3	-	-	3
BTM 503	Measurements & Controls	2	1	-	3
BTM 504	Relational Database Management System	3	-	-	3
BTM 505	Microprocessor System	3	1	-	4
BTM 521	Metrology Lab	-	-	2	1
BTM 522	Measurements & Controls Lab	-	-	2	1
BTM 523	Microprocessor System Lab	-	-	2	1
BTM 524	Programming Lab - II (MAT Lab)	-	-	2	1
BTM 525	Relational Database Management System Lab	-	-	2	1
BTM 541	Communication Skills - III	1	-	-	1
BTM 543	Behavioural Science - V	1	-	-	1
	Foreign Language – V	2	-	-	2
BTM 544	French				
BTM 550	Industrial Practical Training - I (Evaluation)	-	-	-	3
TOTAL CREDITS					**28**
Including CBCS					**31**
Total Hrs Including CBCS					**33**

SIXTH SEMESTER					
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**
BTM 601	Management of Manufacturing Systems	3	-	-	3
BTM 602	Machine Design – II	3	-	-	3
BTM 603	Fluid Power Systems	2	1	-	3
BTM 604	Metal Cutting & Tool Design	3	-	-	3
BTM 605	IC Engine & Gas Turbine	3	-	-	3
BTM 606	Computer Networks	2	1	-	3
BTM 620	Machine Design Lab - II	-	-	2	1
BTM 621	Fluid Power Systems Lab	-	-	2	1
BTM 622	IC Engine & Gas Turbine Lab	-	-	2	1
BTM 641	Communication Skills - IV	1	-	-	1
BTM 643	Behavioural Science - VI	1	-	-	1
	Foreign Language – VI	2	-	-	2
BTM 644	French				
TOTAL CREDITS					**25**
Including CBCS					**28**
Total Hrs Including CBCS					**31**

SEVENTH SEMESTER

Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits
BTM 701	Operations Research	3	-	-	3
BTM 702	Computer Aided Manufacturing	3	-	-	3
BTM 703	Mechatronics	3	-	-	3
BTM 720	Operations Research (Programming) Lab	-	-	2	1
BTM 721	Computer Aided Manufacturing Lab	-	-	2	1
BTM 722	Mechatronics Lab	-	-	2	1
BTM 741	Communication Skills - V	1	-	-	1
BTM 743	Behavioural Science -VII	1	-	-	1
	Foreign Language – VII	2	-	-	2
BTM 744	French				
BTC 750	Practical Training – II(Evaluation)	-	-	-	6
BTC 760	Project (Dissertation)	-	-	-	6
ELECTIVES (Any one from each category)					
A (With Practical)					
BTM 704	Automotive Engineering	3	-	-	3
BTM 705	Computer Aided Designing	3	-	-	3
BTM 723	Automotive Engineering Lab	-	-	2	1
BTM 724	Computer Aided Designing Lab	-	-	2	1
ELECTIVES (Any one from each category)					
B (Without Practical)					
BTM 706	Marketing Management	3	-	-	3
BTM 707	Solar Energy	3	-	-	3
BTM 708	Power Plant Practices	3	-	-	3
BTM 709	Combustion Engine Emissions	3	-	-	3
TOTAL CREDITS					**35**
Total Hrs					**33**

EIGHTH SEMESTER					
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**
BTM 801	Quality Control & Quality Assurance	3	-	-	3
BTM 802	Refrigeration & Air-conditioning	3	-	-	3
BTM 820	Refrigeration & Air-conditioning Lab	-	-	2	1
BTM 841	Communication Skills - VI	1	-	-	1
BTM 843	Behavioural Science - VIII	1	-	-	1
	Foreign Language – VIII	2	-	-	2
BTM 844	French				
BTC 860	Project	-	-	-	9
ELECTIVES (Any one from following with Practical)					
BTM 803	Advanced Methods of Manufacturing	3	-	-	3
BTM 804	Gear Technology	3	-	-	3
BTM 805	Artificial Intelligence & Robotics	3	-	-	3
BTM 821	Advanced Methods of Manufacturing Lab	-	-	2	1
BTM 822	Gear Technology Lab	-	-	2	1
BTM 823	Artificial Intelligence & Robotics Lab	-	-	2	1
TOTAL CREDITS					**24**
Total Hrs.					**26**