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

Date: 04/03/2020

BOARD OF STUDIES
DEPT OF COMPUTER SCIENCE AND ENGINEERING
MINUTES OF THE MEETING

(8 Pages Only)

1. Board of Studies (BoS) meeting has been held by the Department of Computer Science & Engineering, Amity School of Engineering & Technology, Amity University Madhya Pradesh on 4/03/2020 at AUMP, Gwalior, 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) Members

   i. Dr. Sanjay Kumar Gupta, Professor & Head, Dept of Computer Science and Applications, Jiwaji University, Gwalior. (External Member).
   ii. Dr. Venkatadri M., Professor & Head, Dept of Computer Science and Engineering, Amity University Madhya Pradesh, Gwalior. (Member).
   iii. Dr. Subhrendu Guha Neogi, Associate Professor, Dept of Computer Science and Engineering, Amity University Madhya Pradesh, Gwalior. (Member).
   iv. Mr. Ashok Kumar Shrivastava, Asst. Professor, Dept of Computer Science and Engineering, Amity University Madhya Pradesh, Gwalior. (Member).

2. The agenda of the meeting includes the following points:
   (a) Curriculum of B.Tech CSE, B.Tech IT Program for batch 2020-24, BCA program for batch 2020-23, B.Sc. IT program for batch 2020-23, MCA program for batch 2020-23, M.Sc. IT program for batch 2020-22 and M.Tech CSE for batch 2020-22.
   (b) Introducing uniform course codes for Pre-Ph.D course work. Changing the credit hours of the courses for Ph.D program as per the UGC norms and syllabus accordingly.
   (c) Discussion on trends and technologies in CSE and consideration of its inclusion in syllabus.
   (d) Any other point with due permission of the Chairperson.

3. **Discussions/ Comments:**

a. (i) Discussion: The scheme and syllabus of the programs to be offered by CSE Department to B. Tech. CSE for batch 2020-24, B.Tech IT for batch 2020-24, BCA for batch 2020-23, M.Tech CSE for batch 2020-22, M.Sc. IT for batch 2020-22, B.Sc. IT for batch 2020-23 and MCA for batch 2020-23 was presented before the members of the Board of Studies. The Scheme and syllabus of all the subjects was reviewed.

(ii) Comments: The presented scheme and syllabus is well aligned, and no changes were recommended for the scheme and syllabus of B.Tech CSE, B.Tech IT, M.Tech CSE, M.Sc. IT, B.Sc. IT, MCA and BCA.

b. (i) Discussion: The syllabus of Pre-PhD course work subjects was presented to BOS members and reviewed.

(ii) Comments: The syllabus of Pre-PhD course work subjects are well aligned and needs no changes. Uniform course coding is adopted for Pre-PhD course work subjects and credit structure has been reviewed.

c. (i) Discussion: The syllabus of Minor Track (CBCS) subjects was presented to BoS members and reviewed.

(ii) Comments: The existing scheme and syllabus mentioned for CBCS tracks are well aligned. In view of ICT and ICT enabled technologies in teaching learning and professional growth in career, a need arises to introduce a new CBCS Minor Track with name, "IT Skills for Professionals" is recommended.

d. (i) Discussion: Industry interaction is crucial to understand the academic curriculum amendments.

(ii) Comments: Interaction between academia and industry can be addressed through industrial visits by the students.

4. **Recommendations**:

B. Tech Programs

The scheme and syllabus of the programs to be offered by CSE Department to B. Tech. CSE and B.Tech IT for batch 2020-24 were presented before the members of the Board of Studies. The BOS members approved the curriculum and syllabus as per the Annexures.

(B.Tech CSE : Refer Annexure-1)
(B.Tech IT : Refer Annexure-2)

MCA, BCA and B.Sc. IT Programs

The scheme and syllabus of the programs to be offered by CSE Department to MCA, BCA and B.Sc. IT for batch 2020-23 were presented before the members of the Board of Studies. The BOS members approved the curriculum and syllabus as per the Annexures.

(MCA : Refer Annexure-3)
(BCA : Refer Annexure-4)
(B.Sc. IT : Refer Annexure-5)

M.Tech CSE and M.Sc. IT Programs

The scheme and syllabus of the programs to be offered by CSE Department to M.Tech CSE and M.Sc. IT for batch 2020-22 were presented before the members of the Board of Studies. The BOS members approved the curriculum and syllabus as per the Annexures.

(M.Tech CSE : Refer Annexure-6)
(M.Sc. IT : Refer Annexure-7)

Pre Ph.D. Course:

The changes in the scheme and syllabus of the courses. **(Refer Annexure-8)**

CBCS:

All CBCS programs of CSE Specializations, AI & ML, Data Science and Internet of Things in first semester will be of 3 credits only (2 credits lecture and 1 credit tutorial)

(AI & ML : Refer Annexure-9)
(Data Science : Refer Annexure-10)
(Internet of Things : Refer Annexure-11)

Introducing new Minor Track with title, "IT Skills for Professionals". **(Refer Annexure-12)**

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

5. **Summary of changes:**

Changes within Dept of CSE for Existing Programs

Current Syllabus					Proposed Changes/ Modifications			
Sr. No	Program	Course Title	Old Course Code	No. of Credits	Addition/ deletion in the Syllabus	New Course Title	New Course Code	No. of Credits
1	Ph.D	Advanced Computer Networks	PhDEC 102	3	Course deleted from the Scheme	-	-	-
2	Ph.D	-	-	-	Introducing new course	Advanced Data Structures & Algorithm Design	PCS 104	4
3	PhD	Network Security and Management	PhDEC 107	3	Course code and Credit changed in the Scheme	Network Security and Management	PCS 105	4
4	PhD	Data Warehousing and Data Mining	PhDEC 106	3	Course code and Credit changed in the Scheme	Data Warehousing and Data Mining	PCS 106	4
5	PhD	Object Oriented Software Engineering	PhDEC 108	3	Course deleted from the Scheme	-	-	-
6	Ph.D	-	-	-	Introducing new course	Artificial Intelligence & Machine Learning	PCS 107	4
7	Ph.D	Software Project Planning and Management	PhDEC 109	3	Course deleted from the Scheme	-	-	-
8	Ph.D	-	-	-	Introducing new course	Cloud Computing	PCS 108	4
9	Ph.D	Soft Computing	PhDEC 105	3	Course code and Credit changed in the Scheme	Soft Computing	PCS 109	4

10	Ph.D	Software Testing and Quality Assurance	PhDEC 110	3	Course deleted from the Scheme	-	-	-
11	Ph.D	-	-	-	Introducing new course	Image Processing & Pattern Recognition	PCS 110	4
12	CBCS (Minor Track)	-	-	-	Introducing new Minor Track	IT Skills for Professionals	-	18

Summary of CSE Dept courses offering in B.Tech Bio-Technology (AY 2020-21)

Sr. No	Program	Course Title	Old Course Code	No. of Credits	Addition/ deletion in the Syllabus	New Course Title	New Course Code	No. of Credits
1	B.Tech Bio Tech 4th Sem	Database Management System	CSE 304	3	Course has been removed	-	-	-
2	B.Tech Bio Tech 4th Sem	Database Management System lab	CSE 324	1	Course has been removed	-	-	-
3	B.Tech Bio Tech 4th Sem	-	-	-	Course has been introduced	Java Programming	CSE 403	3
4	B.Tech Bio Tech 4th Sem	-	-	-	Course has been introduced	Java Programming Lab	CSE 423	2
5	B.Tech Bio Tech 5th Sem	Java Programming	CSE 403	3	Course has been removed	-	-	-
6	B.Tech Bio Tech 5th Sem	Java Programming Lab	CSE 423	2	Course has been removed	-	-	-
7	B.Tech Bio Tech 5th Sem	-	-	-	New Course has been introduced	Advanced Programming through Python	CSE 510	3
8	B.Tech Bio Tech 5th Sem	-	-	-	New Course has been introduced	Advanced Programming through Python Lab	CSE 530	1
9	B.Tech Bio Tech 7th Sem	Advanced Java Programming	CSE 504	3	Course has been removed	-	-	-
10	B.Tech Bio Tech 7th Sem	Advanced Java Programming Lab	CSE 524	1	Course has been removed	-	-	-
11	B.Tech Bio Tech 7th Sem	-	-	-	New course has been introduced	Relational Database Management System	CSE 710	3
12	B.Tech Bio Tech 7th Sem	-	-	-	New course has been introduced	Relational Database Management System Lab	CSE 730	1
13	B.Tech Bio Tech 8th Sem	ASP .NET	CSE 804	3	Course has been removed	-	-	-
14	B.Tech Bio Tech 8th Sem	ASP .NET	CSE 824	1	Course has been removed	-	-	-

Summary of CSE Dept courses offering in B.Tech ECE (AY 2020-21)

Sr. No	Program	Course Title	Old Course Code	No. of Credits	Addition/ deletion in the Syllabus	New Course Title	New Course Code	No. of Credits
1	B.Tech ECE 2nd Sem	-	-	-	Course has been introduced	Object Oriented Programming Using C++	CSE 204	3
2	B.Tech ECE 2rd Sem	-	-	-	Course has been introduced	Object Oriented Programming Using C++ Lab	CSE 224	1
3	B.Tech ECE 2nd Sem	Data Structures through C++	CSE 202	3	Course has been removed	-	-	-
4	B.Tech ECE 2rd Sem	Data Structures through C++ Lab	CSE 222	1	Course has been removed	-	-	-
5	B.Tech ECE 3rd Sem	-	-	-	Course has been introduced	Data Structures through C++	CSE 202	3
6	B.Tech ECE 3rd Sem	-	-	-	Course has been introduced	Data Structures through C++ Lab	CSE 222	1
7	B.Tech ECE 5th Sem	-	-	-	New Course has been introduced	Advanced Programming through Python	CSE 510	3
8	B.Tech ECE 5th Sem	-	-	-	New Course has been introduced	Advanced Programming through Python Lab	CSE 530	1
9	B.Tech ECE 6th Sem	Advanced Java Programming	CSE 504	3	Course has been removed	-	-	-
10	B.Tech ECE 6th Sem	Advanced Java Programming Lab	CSE 524	1	Course has been removed	-	-	-
11	B.Tech ECE 6th Sem	-	-	-	New Course has been introduced	Problem Solving Techniques	CSE 604	3
12	B.Tech ECE 6th Sem	-	-	-	New Course has been introduced	Problem Solving Techniques Lab	CSE 624	2
13	B.Tech ECE 7th Sem				New course has been introduced	Relational Database Management System	CSE 710	3
14	B.Tech ECE 7th Sem				New course has been introduced	Relational Database Management System Lab	CSE 730	1

Summary of Semester wise Common Subjects offered by Dept of CSE

Subject Details			Programs and Semester						
S. No.	Subject Code	Subject title	BCA	B.Tech (CSE/IT)	B.Tech (ECE)	B.Tech (CE)	B.Tech (ME)	B.Tech (BT)	Credits
1	CSE 104	Programming for Problem Solving	1st	1st	1st	1st	1st	1st	3
2	CSE 124	Programming for Problem Solving Lab	1st	1st	1st	1st	1st	1st	2
3	CSE 204	Object Oriented Programming Using C++	2nd	2nd	2nd	2nd	2nd	2nd	3
4	CSE 224	Object Oriented Programming Using C++ Lab	2nd	2nd	2nd	2nd	2nd	2nd	1
5	CSE 202	Data Structures through C++	3rd	3rd	3rd	-	-	3rd	3
6	CSE 222	Data Structures through C++ Lab	3rd	3rd	3rd	-	-	3rd	1
7	CSE 403	Java Programming	4th	4th	4th	-	-	4th	3
8	CSE 423	Java Programming Lab	4th	4th	4th	-	-	4th	2
9	CSE 302	Python Programming	3rd	3rd	-	-	-	-	3
10	CSE 322	Python Programming Lab	3rd	3rd	-	-	-	-	1
11	CSE 304	Database Management Systems	3rd	3rd	-	-	-	-	3
12	CSE 324	Database Management Systems Lab	3rd	3rd	-	-	-	-	1
13	CSE 303	Design and Analysis of Algorithms	5th	5th	-	-	-	-	4
14	CSE 323	Design and Analysis of Algorithms lab	5th	5th	-	-	-	-	1
15	CSE 510	Advanced Programming though Python	-	-	5th	-	-	5th	3
16	CSE 530	Advanced Programming through Python Lab	-	-	5th	-	-	5th	1
17	CSE 604	Problem Solving Techniques	-	6th	6th	-	-	-	-
18	CSE 624	Problem Solving Techniques Lab	-	6th	6th	-	-	-	-
19	CSE 710	Relational Database Management Systems	-	-	7th	-	-	7th	3
20	CSE 730	Relational Database Management Systems Lab	-	-	7th	-	-	7th	1
21	CSE 605	Software Engineering	6th	6th	-	-	-	-	-
22	CSE 625	Software Engineering Lab	6th	6th	-	-	-	-	-

MOOC courses are included in three courses as per the UGC guidelines (Cloud Computing, Data Analytics and Network Security) as per the following details.

S. No.	Name of the Minor Track	MOOC Course by UGC	Course Code	Semester	Credits
1	Cloud Computing	Cloud Computing	4739	II	3
2	Data Analytics	Discrete Data Analytics	5726	IV	4
3	Network Security	Computer Network and Internet Protocol	4759	III	3

BOARD OF STUDIES
DEPT OF COMPUTER SCIENCE AND ENGINEERING

Signature of Members:

Mr. Ashok Kumar Shrivastava
Member

Dr. Subhrendu Guha Neogi
Member

Prof. (Dr.) Venkatadri. M
Member

4.3.2020

Prof. (Dr.) Sanjay Gupta
External Member

Prof (Dr) R S Tomar
Dean (Academics)
AUMP, Gwalior

Maj Gen (Dr) S C Jain
Chairman- BOS

06/03/2020.

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

17/3/2020

APPROVED BY
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)
Amity School of Engineering & Technology

Remarks & Suggestions by BOS Members

MOOC Courses for the Department of Computer Science & Engineering

The following course of SWAYAM are recommended to be given as CBCS "Cloud Computing", "Network Security" in the Batch 2020-2024: -

S No.	Name of Minor Track	Semester	Name of course from SWAYAM	Duration	Credits
1	Cloud Computing	II [CBA 202]	Cloud Computing	12 Weeks	3
2	Network Security	III [CBC 302]	Computer Network and Internet Protocol	12 Weeks	3

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

Date: 05 / 03 /2020

BOARD OF STUDIES (Civil Engineering)

MINUTES OF THE MEETING

(06 Pages Only)

1. A meeting of Board of Studies (BoS) of Department of Civil Engineering, Amity School of Engineering & Technology, Amity University Madhya Pradesh was held on 05/03/ 2020 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 & Head, Department of Civil Engineering MITS Gwalior, External Member

   ii) Dr. V.K. Gupta, Associate Professor and Head of Civil Engineering, Amity University Madhya Pradesh, Gwalior, Member.

   iii) Mr. Mohan Kantharia Asst. Professor, Civil Engineering, Amity University Madhya Pradesh, Gwalior, Member.

   iv) Dr. Ripunjoy Gogoi Asst. Professor, Civil Engineering, Amity University Madhya Pradesh, Gwalior, Member.

2. **The agenda of the meeting included the following:**
   (a) Curriculum of first year B.Tech CE Program for 2020-24 Batch.
   (b) Introducing uniform Course code for Pre-PhD course work subjects and changing their credit structure.
   (c) Discussion on trends and technologies in CE and consideration of its inclusion in syllabus.
   (d) Any other point with due permission of the Chairperson.

3. **Discussions/Comments:**
   a. (i) Discussion: The syllabus of the subjects offered by B.Tech (Civil Engineering) 2020-24 Batch was presented before the members of the Board of Studies. The scheme and syllabus of the courses have been reviewed.

   (ii) Comments: The existing Scheme and syllabus is well aligned, and few changes were recommended in few subjects.

b. (i) Discussion: The syllabus of M. Tech, CBCS and Pre PhD course work subjects was presented to BOS members and reviewed.

(ii) Comments: The syllabus of M. Tech., CBCS subjects is well aligned and need no change. Uniform course coding is adopted for Pre-PhD course work subjects and credits structure has been reviewed.

4. Recommendations:

B. Tech. Program

(a) The Scheme and syllabus of the subjects to be offered by Civil Engineering Department to B. Tech. CE for batch 2020-24 was presented before the members of the board of studies. The BOS members approved the CE curriculum and syllabus (Refer Annex.-1).

i) The subject "Basic Civil Engineering and Applied Mechanics" (CIV 101) with credits 2, has been introduced in B.Tech program in first semester.

ii) Subjects, Energy Science & Engineering (CIV 304) and Basic Civil Engineering (CIV 305) have been merged and a new subject, Civil Engineering & Energy Science (CIV 308) of credit 4, has been introduced. Similarly, Subjects, Biology for Engineers (CIV306) and Life Science (CIV 307) are merged and a new subject, Life Science/Biology for Engineers (CIV 309) of credit 3 has been introduced. The credit of Computer Aided Civil Engineering Drawing (CIV302) is increased by 1 (From Credit 2 to 3)

iii) Subject Disaster Preparedness & Planning (CIV 406) has been shifted to elective subject in VIIth Semester with code CIV 406 of credits 3. The available credits have been equally distributed in the Solid Mechanics (CIV 405) and Fluid Mechanics (CIV 404).

iv) The subject Mechanics of Material (CIV 501) has been removed from Vth Semester due to repetition of contents in Solid Mechanic of Material (CIV 405). The available credits have been equally adjusted in the subjects which are; Structural Engineering (CIV 503), Geotechnical Engineering (CIV 504) and Transportation Engineering (CIV 507).

v) The subject, Earthquake Resistant Design of Buildings (CIV 806) along Non-Destructive Testing Lab (CIV 826) has been included in the electives of 8th Semester.

vi) At least one Industrial visit has been incorporated in the subjects, Building Technology (CIV 305), Material Testing & Evaluation (CIV 401), Hydrology & Water Resources Engineering (CIV 505), Geometric Design of Highways (CIV 602) and Design of Concrete Structures (CIV 701).

M. Tech Program:

There is no change in the scheme and syllabus of the course. (Refer Annexure-2)

Pre Ph.D. Course:

There is a change in the scheme and syllabus of the courses. (Refer Annexure-3)
PhDECE 102: Optimization Techniques- (Credits: 3)
PhDECE 103: Foundation Engineering- (Credits: 3)

CBCS:

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

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

5. **Summary of the changes is given below: -**

A. Summary of the changes for B.Tech. CE:

Currents syllabus				Proposed Syllabus /Modification		
Sr. No.	**Course Title**	**Old Course Code**	**No. of Credits**	**Changes/Modifications (addition/deletion in the Syllabus)**	**New Course Code**	**No. of Credits**
1				Basic Civil Engineering and Applied Mechanics	CIV 101	2
2	Energy Science and Engineering	CIV 304	2	Civil Engineering and Energy Science (merged)	CIV 308	4
	Basic Civil Engineering	CIV 305	2			
3	Biology for Engineering	CIV 306	2	Life Science/ Biology for Engineering (merged)	CIV 309	3
	Life Science	CIV 307	2			
4	Computer Aided Civil Engineering Drawing	CIV 302	2	No Change	No Change	3
5	Disaster Preparedness and Planning	CIV 406	2	Shifted to VII Semester (Elective)	No Change	3
6	Fluid Mechanics	CIV 404	2	No Change	No Change	3
7	Solid Mechanics	CIV 405	2	No Change	No Change	3
8	Mechanics of Materials	CIV 501	3	Removed from syllabus (due to repetition of contents in CIV 405 Solid Mechanics)	-	-
9	Structural Engineering	CIV 503	3	No Change	No Change	4
10	Geotechnical Engineering	CIV 504	2	No Change	No Change	3
11	Transportation Engineering	CIV 507	2	No Change	No Change	3
12	-	-	-	Earthquake Resistant Design of Buildings (New subject)	CIV 806	3
13	-	-	-	Non-Destructive Testing Lab (New Lab)	CIV 826	1

B. Summary of the changes is given below (PhD):

Current Syllabus					Proposed Changes/Modification			
Sr. No.	Programme	Course Title	Old Course Code	No. of Credits	Addition/ Deletion in the Syllabus	New Course Title	New Course Code	No of Credits
Optional (Discipline Specific Subject)								
i) Existing								
(1)	PhD (Civil)	Optimization Techniques	PhDEC E102	3	No Change	No Change	PCE 101	4
(2)	PhD (Civil)	Foundation Engineering	PhDEC E103	3	No Change	No Change	PCE 102	4
ii) New Subjects Introduced								
(3)	PhD (Civil)	--	--	--	New Subject	Smart Materials & Techniques	PCE 103	4
(4)	PhD (Civil)	--	--	--	New Subject	Earthquake Resistant Design of Structure	PCE 104	4
(5)	PhD (Civil)	--	--	--	New Subject	Structural Health Monitoring	PCE 105	4
(6)	PhD (Civil)	--	--	--	New Subject	Advance Geotechnical Engineering	PCE 106	4
(7)	PhD (Civil)	--	--	--	New Subject	Finite Element Method	PCE 107	4

BOARD OF STUDIES (B.Tech. CE)
MINUTES OF THE MEETING

Signature of Members:

Mr. Mohan Kantharia
(Member)

Dr. Ripunjoy Gogoi
(Member)

Dr. V. K. Gupta
(Member)

05/03/2020

Prof. (Dr.) Manoj Kumar Trivedi
External Member

Maj Gen (Dr) S C Jain
Chairman- BOS

06/3/2020

Prof. (Dr.) R. S. Tomar
Dean Academics
AUMP, Gwalior

06/03/2020

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

APPROVED BY

12/3/2020

Hon'ble Vice Chancellor
AUMP, Gwalior

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

MEETING OF BOARD OF STUDIES (BOS)
(Civil Engineering)
Amity School of Engineering & Technology
March 2020

Remarks & Suggestions by BOS Members

Bachelor of Technology
(Civil Engineering)

CIV

AICTE MODEL CURRICULUM

(2020-24 Batch)

Bachelor of Technology
(Civil Engineering)

Programme Code: CIV

Duration – 4 Years Full Time

Programme Structure
&
Curriculum & Scheme of Examination

2020-24
(Based on AICTE)

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 different codes used for the components of evaluation are given below:-

Components	**Codes**
Case Discussion/ Presentation/ Analysis	C
Home Assignment	H
Project	P
Seminar	S
Viva	V
Quiz	Q
Class Test	CT
Attendance	A
End Semester Examination	ESE

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.

[illegible] 2020

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.

PROGRAMMESTRUCTURE

FIRST SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
MAT101	Applied Mathematics – I (Calculus and Linear Algebra)	3	1	-	4	40
CHE101	Applied Chemistry	3	1	-	4	40
CSE104	Programming for Problem Solving	3	-	-	3	30
BME101	Engineering Graphics & Design	1	-	-	1	10
CIV101	Basic Civil Engineering & Applied Mechanics	2	-	-	2	20
CHE121	Applied Chemistry Lab	-	-	2	1	20
CSE124	Programming for Problem Solving Lab	-	-	4	2	40
BME121	Engineering Graphics & Design Lab	-	-	4	2	40
BCU141	Communication Skills – I	1			1	10
EVS142	Environmental Studies – I	2	-	-	2	20
BSU143	Behavioural Science – I	1	-	-	1	10
FLU144	French -I	2	-	-	2	20
CBCS		3	-	-	3	30
TOTAL CREDITS (Including CBCS)					**28**	
Total Hours Including CBCS per week					**33**	
Total Hours in the Semester					**330**	

SECOND SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
MAT201	Applied Mathematics–II (Ordinary & Partial Differential Equations and Transform)	3	1	-	4	40
PHY101	Applied Physics – I	3	1	-	4	40
ECE101	Basic Electrical Engineering	3	-	-	3	30
CSE204	Object Oriented Programming Using C++	2	1	-	3	30
BME102	Workshop/ Manufacturing Practices	1	-	-	1	10
PHY121	Applied Physics Lab – I	-	-	2	1	20
ECE121	Basic Electrical Engineering Lab	-	-	2	1	20
CSE224	Object Oriented Programming Using C++ Lab	-	-	2	1	20
BME122	Workshop/ Manufacturing Practices Lab	-	-	4	2	40
BCU241	Communication Skills – II	1	-	-	1	10
EVS242	Environmental Studies – II	2	-	-	2	20
BSU243	Behavioural Science – II	1	-	-	1	10
FLU244	French -II	2	-	-	2	20
CBCS		3	-	-	3	30
TOTAL CREDITS (Including CBCS)					**29**	
Total Hours Including CBCS per week					**34**	
Total Hours in the Semester					**340**	
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**	**Hours**
MAT 301	Applied Mathematics- III (Probability, Statistics and Numerical Methods)	3	-	-	3	30
CIV 302	Computer-Aided Civil Engineering Drawing	3	-	-	3	30
CIV 303	Engineering Mechanics	3	1	-	4	40
CIV 308	Civil Engineering and Energy Science	3	1	-	4	40
CIV 309	Life Science/Biology for Engineering	3	-	-	3	30
BME 104	Mechanical Engineering	2	-	-	2	20
ECE 307	Basic Electronics	2	-	-	2	20
CIV 322	Computer-aided Civil Engineering Drawing Lab	-	-	2	1	20
ECE 327	Basic Electronics Lab	-	-	2	1	20
BCU 341	Communication Skills – III	1	-	-	1	10
BSU 343	Behavioural Science – III	1	-	-	1	10
FLU 344	French – III	2	-	-	2	20
NTP 330	**Term paper (Evaluation)**	-	-	-	2	
CBCS		3	-	-	3	30
TOTAL CREDITS (Including CBCS)					**32**	
Total Hours. including CBCS					**32**	
Total Hours in the Semester					**320**	

FOURTH SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
CIV 401	Materials, Testing & Evaluation	2	-	-	2	20
CIV 402	Engineering Geology	2	-	-	2	20
CIV 403	Surveying	1	1	-	2	20
CIV 404	Fluid Mechanics	**3**	-	-	**3**	**30**
CIV 405	Solid Mechanics	**3**	-	-	**3**	**30**
CIV 407	Civil Engineering - Societal & Global Impact	1	1	-	2	20
ECE 407	Instrumentation & Sensor Technologies for Civil Engineering Applications	2	-	-	2	20
CIV 421	Materials Testing and Evaluation Lab	-	-	2	1	20
CIV 422	Engineering Geology Lab	-	-	2	1	20
CIV 423	Surveying lab	-	-	2	1	20
CIV 424	Fluid Mechanics Lab	-	-	2	1	20
ECE 427	Instrumentation & Sensor Technologies for Civil Engineering Applications Lab	-	-	2	1	20
BCU 441	Communication Skills – IV	1	-	-	1	10
BSU 443	Behavioural Science – IV	1	-	-	1	10
FLU 444	French – IV	2	-	-	2	20
CBCS		3	1	-	4	40
TOTAL CREDITS (Including CBCS)					**29**	
Total Hours including CBCS					**34**	
Total Hours in the Semester					**340**	
INDUSTRIAL 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**	**Hours**
CIV 502	Hydraulic Engineering	2	-	-	2	20
CIV 503	Structural Engineering	**3**	**1**	-	**4**	**40**
CIV 504	Geotechnical Engineering	**3**	-	-	**3**	**30**
CIV 505	Hydrology & Water Resources Engineering	3	-	-	3	30
CIV 506	Environmental Engineering – I	3	-	-	3	30
CIV 507	Transportation Engineering	**3**	-	-	**3**	**30**
CIV 522	Hydraulic Engineering Lab	-	-	2	1	20
CIV 524	Geotechnical Engineering Lab	-	-	2	1	20
CIV 527	Transportation Engineering Lab	-	-	2	1	20
BCU 541	Communication Skills – V	1	-	-	1	10
BSU 543	Behavioural Science – V	1	-	-	1	10
FLU 544	French – V	2	-	-	2	20
NPT 550	**Industrial Practical Training I (Evaluation)**	-	-	-	3	-
CBCS		3	1	-	4	40
TOTAL CREDIT (Including CBCS)					**32**	
Total Hours including CBCS					**32**	
Total hours in semester					**320**	

SIXTH SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
CIV 601	Construction Engineering & Management	2	1	-	3	30
CIV 602	Geometric Design of Highways	3	-	-	3	30
CIV 603	Environmental Engineering – II	3	-	-	3	30
CIV 604	Estimating and Costing	2	-	-	2	20
CIV 622	Geometric Design of Highways Lab	-	-	2	1	20
CIV 623	Environmental Engineering – II Lab	-	-	2	1	20
CIV 624	Estimating and Costing Lab	-	-	2	1	20
ELECTIVES (Any one from following with Practical)					**4**	**50**
CIV 605	River Engineering	3	-	-	-	-
CIV 606	Open Channel Flow	3	-	-	-	-
CIV 607	Solid and Hazardous Waste Management	3	-	-	-	-
CIV 625	River Engineering Lab	-	-	2	-	-
CIV 626	Open Channel Flow Lab	-	-	2	-	-
CIV 627	Solid and Hazardous Waste Management Lab	-	-	2	-	-
BCH 620	Engineering Economics	2	1		3	30
BCU 641	Communication Skills – VI	1	-	-	1	10
BSU 643	Behavioural Science – VI	1	-	-	1	10
FLU 644	French – VI	2	-	-	2	20
NMP 660	**Minor Project**	-	-	-	2	-
CBCS		-	-	-	1	-
TOTAL CREDIT (Including CBCS)					**28**	
Total Hours per week					**29**	
Total hours in semester					**290**	
INDUSTRIAL PRACTICAL TRAINING II: 6-8 WEEKS						

SEVENTH SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
CIV 701	Design of Concrete Structures	3	1		4	40
ELECTIVES (Any one from each category) A. (With Practical)					4	50
CIV 702	Surface Hydrology	3	-	-	-	-
CIV 703	Water Resources Field Methods	3	-	-	-	-
CIV 704	Environmental Fluid Mechanics	3	-	-	-	-
CIV 722	Surface Hydrology Lab	-	-	2	-	-
CIV 723	Water Resources Field Methods Lab	-	-	2	-	-
CIV 724	Environmental Fluid Mechanics Lab	-	-	2	-	-
ELECTIVES (Any one from each category) B. (Without Practical)					3	30
CIV 705	Concrete Technology	3	-	-	-	-
CIV 706	Pres-stressed Concrete	3	-	-	-	-
CIV 707	Masonry Structures	3	-	-	-	-
CIV 406	**Disaster Preparedness & Planning**	**3**	-	-	-	-
BCU 741	Communication Skills – VII	1	-	-	1	10
BSU 743	Behavioural Science – VII	1	-	-	1	10
FLU 744	French – VII	2	-	-	2	20
NPT 750	**Industrial Practical Training–II (Evaluation)**	-	-	-	5	-
NMP 760	**Major Project – I**	-	-	-	6	-
TOTAL CREDIT					**26**	
Total hours per week					**16**	
Total hours in semester					**160**	

EIGHTH SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
CIV 801	Design of Steel Structures	3	1	-	4	40
CIV 802	Airport Planning and Design	3	-	-	3	30
ELECTIVES (Any one from following with Practical)					4	50
CIV 803	Foundation Engineering	3	-	-	-	-
CIV 804	Structural Geology	3	-	-	-	-
CIV 805	Rock Mechanics	3	-	-	-	-
CIV 806	Earthquake Resistant Design of buildings	3	-	-	-	-
CIV 823	Foundation Engineering Lab	-	-	2	1	-
CIV 824	Structural Geology Lab	-	-	2	1	-
CIV 825	Rock Mechanics Lab	-	-	2	1	-
CIV 826	Non-Destructive testing Lab	-	-	2	1	-
BCU 841	Communication Skills – VIII	1	-	-	1	10
BSU 843	Behavioural Science – VIII	1	-	-	1	10
FLU 844	French – VIII	2	-	-	2	20
NMP 860	**Major Project – II**	-	-	-	9	-
TOTAL CREDIT					**24**	
Total hours per week					**16**	
Total hours in semester					**160**	

Bachelor of Technology
(Civil Engineering)

Programme Code: CIV

Duration – 4 Years Full Time
(2020-24)

OVERALL CREDIT

Sr. No.	Semester	No. of Credits	No. of Hours
1	I	28	33
2	II	29	34
3	III	32	32
4	IV	29	34
5	V	32	32
6	VI	28	29
7	VII	26	16
8	VIII	24	16
Total Credits		**228**	**226**

MOOC Courses for the Department of Civil Engineering

The following course of SWAYAM is recommended to be given as CBCS "Strength of Materials" in the Batch 2020-2024: -

S No.	Name of Minor Track	Semester/ CBCS Course Code/ Course Name	Name of course from SWAYAM	Duration	Credits
1	Strength of Materials	III / CIV303 Engineering Mechanics	Mechanics Of Materials	12 Weeks	3

More than 70 % consistency/ similarity exist between the syllabus of course offered in the CBCS and MOOC course.

Signatures : ....

BASIC CIVIL ENGINEERING & APPLIED MECHANICS

Course Code: CIV 101

Credit Units: 02
Total Hours: 20

Course Objectives:

- To understand the utility of various types of building materials.
- To understand the location, construction detail and suitability of various building elements.
- To determine the location of object on ground surface.
- To understand the effects of system of forces on rigid body in static conditions.
- Introduction to smart city and its component.

Course contents:

Module I: Building Materials: (4 Hours)

Stones, bricks, cement, timber - types, properties, test & uses, Introduction of concrete properties & Laboratory tests on concrete, curing of concrete and mortar Materials.

Module II: Surveying & Positioning: (4 Hours)

Introduction to surveying, Survey stations, Measurement of distances; conventional and EDM methods, Measurement of directions by different methods, Measurement of elevations by different methods, reciprocal levelling.

Module III: Smart City: (4 Hours)

Elements of smart city, Role of experts of various discipline of engineering in the development of smart city. Concept of green buildings, including rainwater harvesting, non-conventional sources of energy, Smart transportation and drainage system.

Module IV: Forces and Equilibrium: (4 Hours)

Graphical and Analytical Treatment of Concurrent and non-concurrent coplanar forces, free body Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses, method of joints, method of Sections.

Module V: Centre of Gravity and moment of Inertia: (4 Hours)

Centroid and Centre of Gravity, Moment of Inertia of Composite section. Support Reactions, Shear force and bending moment diagram for cantilever & simply supported beam with concentrated, distributed load and Couple.

Course Outcomes:

Upon completion of the course, the students will be able to:

- Explain concepts and terminologies of building materials, surveying and mechanics.
- Apply various methods for surveying and mechanics.
- Determine the location, area and volume of objects on ground surface.
- Solve the problems of surveying and mechanics by using various methods.
- Analyse the effects of system of forces on rigid bodies in static conditions.

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:

- Surveying, Vol. – 1, Punmia B.C., Laxmi Publications, 17th edition, 2016
- Building Material, B. C. Punmia, Laxmi Publications,2016
- A textbook of Engineering Mechanics, D. S. Kumar, Katsons Publications, 2013
- Basic Civil Engineering, S. Ramamrutam & R. Narayan, Dhanpat Rai Pub., 3rd edition, 2013
- Applied Mechanics, Prasad I.B., Khanna Publication 17th edition, 1996
- Surveying, Duggal, Tata McGraw Hill New Delhi, 4th edition, 2013
- Engineering Mechanics - Statics & Dynamics, R.C. Hibbler, Pearson Publications, 14th edition, 2015
- Engineering Mechanics - statics dynamics, A. Boresi & Schmidt, Cengage learning,1st edition, 2008.
- Applied Mechanics, R.K. Rajput, Laxmi Publications, 3rd edition, 2016

CIVIL ENGINEERING & ENERGY SCIENCE

Course Code: CIV 308

Credit Units: 04
Total Horus : 40

Course Objective:

- To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering.
- To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness.
- To provide an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.

The class will explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, geothermal, ocean thermal, hydro and nuclear.

Course Contents:

Module I: Introduction :(8 Hours)
What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career. Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers. Introduction to Energy Science: Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues

Module II: Energy Sources :(8 Hours)
Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

Module III: Energy & Environment :(8 Hours)
Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy;; How future energy use can be influenced by economic, environmental, trade, and research policy

Module IV: Civil Engineering Projects connected with the Energy Sources:(8 Hours)
Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor; Spent Nuclear fuel storage and disposal systems

Module V: Engineering for Energy conservation: (8 Hours)
Concept of Green Building and Green Architecture; Green building concepts; LEED ratings. Energy Audit of Facilities and optimization of energy consumption: Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities.

Course Outcomes:

- List and generally explain the main sources of energy and their primary applications nationally and internationally
- Have basic understanding of the energy sources and scientific concepts/principles behind them
- Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.
- List and describe the primary renewable energy resources and technologies.
- To quantify energy demands and make comparisons among energy uses, resources, and technologies.
- Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.
- Understand the Engineering involved in projects utilising these sources

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; Att: Attendance

Text & References :

- Patil, B.S.(1974), Legal Aspects of Building and Engineering Contract
- The National Building Code, BIS, (2017)
- RERA Act, (2017)
- Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
- Chandiramani, Neelima (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
- Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
- Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press
- Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
- Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
- Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
- UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
- E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company
- Related papers published in international journals

COMPUTER-AIDED CIVIL ENGINEERING DRAWING

Course Code: CIV 302

Credit Units: 03
Total Hours: 30

Course Objective:

The students will be able to

- Develop Parametric design and the conventions of formal engineering drawing including elements of buildings, building bye-laws, perspective drawing etc
- Produce and interpret 2D & 3D drawings
- Communicate a design idea/concept graphically/ visually

Course Contents:

Module I: Basics of Auto Cad (2-D) and Auto Cad (3-D): (6 Hours)
Two-dimensional drafting work to be handled in detail on Auto Cad. Complete Drafting, Editing and modification work to be done and presentations be made.Basic commands and usage of 3d Auto Cad drawing. Drafting basic geometrical forms and combinations of the same in three dimensions and their editing.

Module II: Elements of Building Drawing: (6 Hours)
Symbols and sing Conventions used for materils, plumbing, rebar drawing, electrical fittings. Masonry Bonds details, one brick wall and one and half brick wall, wall connections, . RCC beam, column, footings, foundation plan,load wearing wall.

Module III: Building Drawing: (6 Hours)
Detail drawing of single story building Plan, Elevation, Sectional Elevation. Standard fittings, drawings of different types of buildings. .

Module IV: Building Bye-laws: (6 Hours)
Building Planning – Provisions of National Building Code, open area,setbacks, FAR terminology, principles of planning, orientation. site selection, types of drawings. Types of buildings. Classification of structure, Load bearing structure, Framed structure, Composite structure.

Module V: Perspective Drawing: (6 Hours)
Elements of perspective drawing involving simple problems, one point and two point perspectives.

Course Outcomes:

The course should enable the students to

- Develop graphical skills for communicating concepts, ideas and designs of engineering products graphically/ visually as well as understand another person's designs, and to get exposure to national standards relating to technical drawings using Computer Aided Design and Drafting practice
- Develop Parametric design and the conventions of formal engineering drawing
- Produce and interpret 2D & 3D drawings
- Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.
- Do a detailed study of an engineering artefact
- Develop drawings for conventional structures using practical norms.

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; Att: Attendance

Text & References:

- Building Drawing Shah M. G. Kale C. M, Tata McGraw-Hill Education
- Planning & Designing of Building Sane Y. S, Allies Book Stall
- Architectural Design Ernest Pickering, J. Wiley & Sons
- National Building Code-2005

- Malik & Meo; Building Design and Drawing
- Gurucharan Singh & Jgdish Singh Building Planning, Design and Scheduling
- Balagopal T S Prabhu, Building Drawing and Detailing, Spades Publishers.
- V.B. Sikka : Civil Engineering Drawing

LIFE SCIENCE/BIOLOGY FOR ENGINEERS

Course Code: CIV 309

Credits Units: 03
Total Hours: 30

Course Objectives:

- To gain knowledge of the subject biology, its importance, to provide basic knowledge about plant physiology, ecology, ecosystems, population ecology, environmental management, protection Acts & elementary principles of biostatical methods & tools.

- To understand cellularity in structural development, classification of species, the metabolism processes Elementary principles of genetics, Structures of DNA and RNA, Molecular genetics, Biostatistics, Biotechnology.

Course Content:

Module I: Unicellularity and Multicellularity: (5 Hours)
What is Life sciences/Biology? Classification per se is not what biology is all about (The underlying criterion, such as morphological, biochemical or ecological be highlighted). Hierarchy of life forms at phenomenological level. Classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitats- acquatic or terrestrial.

Module II: Why We Need to Study Biology: (5 Hours)
To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry. Bring out the fundamental differences between science and engineering. Mention the most exciting aspect of biology as an independent scientific discipline. Discuss how biological observations of 18th Century that lead to major discoveries.

Module III: Molecules of Life & Molecular Genetics: (5 Hours)
Molecules of life, Discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins, Lipids. Nucleotides and DNA/RNA structure & concept of gene.

Module IV: Plant Diversity: (5 Hours)
Unicellular and multicellular organisms, prokaryotes and eukaryotes, Autotrophs, heterotrophs, Hierarchy of life forms, Classification, General account and importance of Virus, Bacteria, Fungi, Lichens, Bryophytes, pteridophytes, Gymnosperms, Angiosperms.

Module V: Concepts of Recessiveness and Dominance: (5 Hours)
Principles of Genetics in biology are like Newton's laws to Physical Sciences. Mendel's laws, Meiosis and Mitosis (be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring).

Module VI: Ecology, Ecosystems & Population Ecology: (5 hours)
Components, types, flow of matter and energy in an ecosystem; Ecosystem structure- Biotic and a-biotic factors, food chain, food web, ecological pyramids.
Population characteristics, ecotypes; Population genetics- Environmental Management, Policies and legal aspects- Environment Protection Acts, International Treaties; Environmental Impact Assessment

Course outcome:

After completion of this course students will be able to understand

- The significance of biological sciences
- Develop an understanding of the different life forms from microbes to higher plants and their importance in human life.
- Develop an understanding of the ecosystems, community ecology, ecosystem structure etc.
- Develop an insight into the various environmental management covering principles environment protection Acts. Environmental Impact Assessment

- Cellular structures of living forms.
- Classification of biology and biomolecule
- About DNA and biological structure
- About the species
- Exploring Molecular Genetics

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; Att: Attendance

Text & References:

- Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd.
- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopedia,Jaico Publ.House,Mumabai, 1196p
- Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House,Delhi 284 p. Mckinney, M.L. &School, R.M. 1996.Environmental Science Systems &Solutions, Web enhanced edn. 639p
- Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
- Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
- Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
- Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

DISASTER PREPAREDNESS & PLANNING MANAGEMENT

Course Code: CIV 406

Credit Units: 03
Total Hours: 30

Course Objectives:
The objectives of the course are

- To Understand basic concepts in Disaster Management
- To Understand Definitions and Terminologies used in Disaster Management
- To Understand Types and Categories of Disasters
- To Understand the Challenges posed by Disasters
- To understand Impacts of Disasters Key Skills

Course Contents:

Module I: Introduction: (6 Hours)
Concepts and definitions: disaster, hazard, vulnerability, risks- severity, frequency and details, capacity, impact, prevention, mitigation).

Module II: Disasters: (6 Hours)
Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Module III: Disaster Impacts: (6 Hours)
Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Module IV: Disaster Risk Reduction (DRR): (6 Hours)
Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, DRR programmes in India and the activities of National Disaster Management Authority.

Module V: Disasters, Environment and Development: (6 Hours)
Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land- use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Course Outcomes:

Upon completion of the course, the students will be able to:

- Understanding about the basic concepts of Disaster Management with preparedness as a Civil Engineer.
- Understand the risk to property, lives, and livestock, etc. and understanding of the social responsibility as an engineer towards preparedness as well as mitigating the damages
- Apply the Disaster Concepts to Management
- Analyze Relationship between Development and Disasters
- Understand Categories of Disasters and realization of the responsibilities to society

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; Att: Attendance

Text & References:

- Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
- Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.

- Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
- Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
- Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC
- http://ndma.gov.in/ (Home page of National Disaster Management Authority)
- http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

FLUID MECHANICS

Course Code: CIV 404

Credit Units: 03
Total Hours: 30

Course Objectives:

- The course will help students to understand the various properties, types and characteristics of fluid. It will help students to design pipes, pipe bents, pipe surface design etc.

Course Contents:

Module I: Basic Concepts and Definitions: (6 Hours)
Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Module II: Fluid Statics: (6 Hours)
Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

Module III: Fluid Kinematics: (6 Hours)
Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three -dimensional continuity equations in Cartesian coordinates

Module IV: Fluid Dynamics: (6 Hours)
Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber *Number and Euler Number; Buckingham's* π-Theorem. Notches and Weirs.

Module V: Fluid Dynamics: (6 Hours)
Boundary layer theory, drag and lift force, drag on a sphere, rough and smooth boundaries, concept of mixing length, boundary layer distribution for various shapes and for various Reynold's number.

Course Outcomes:

- Students should understand the properties of fluids, pressure measurement devices, hydraulic forces on surfaces, bouncy and flotation in fluids, kinematics and static behavior of fluids, dimension and model analysis, laminar and turbulent flow, flow through pipes and orifices, boundary layer theory.

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; Att: Attendance

Text & References:

- 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.
- 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

SOLID MECHANICS

Course Code: CIV 405

Credit Units: 03
Total Hours: 30

Course Objectives:

- To student will understand simples stresses and strains, compound stresses and strains, bending moments and shear strains, flexural stresses etc.

Module I: Simple Stresses and Strains: (6 Hours)
Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law-stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience-Gradual, sudden, impact and shock loadings – simple applications.

Module II: Compound Stresses and Strains: (6 Hours)
Two-dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two-dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants.

Module III: Bending moment and Shear Force Diagrams: (6 Hours)
Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

Module IV: Flexural Stresses-Theory of simple bending: (6 Hours)
Assumptions – Derivation of bending equation: M/I = f/y = E/R - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Module V: Shear Stresses- Derivation of formula: (3 Hours)
Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

Module 6: Torsion: (3 Hours)
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.. Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

Course Outcomes:

Students will understand the following.

- Simple Stresses and Strains
- Compound Stresses and Strains
- Bending moment and Shear Force Diagrams
- They will develop skills to problem solving in solid mechanics.

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; Att: Attendance

Text & References:

- 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.
- 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

STRUCTURAL ENGINEERING

Course Code: CIV 503

Credit Units: 04
Total Hours: 40

Course Objectives:

- This course aims at providing students with a solid background on principles of structural engineering design.

Course Content:

Module I: Introduction Concepts of Energy Principles: (8 Hours)
Introduction- concepts of energy principles, safety, sustainable development in performance; what makes a structure; principles of stability, equilibrium; what is a structural engineer, role of engineer, architect, user, builder; what are the functions' what do the engineers design, first principles of process of design

Module II: Different Types of Loads on Structures: (8 Hours)
Planning and Design Process; Materials, Loads, and Design Safety; Behaviour and Properties of Concrete and Steel; Wind and Earthquake Loads.

Module III: Structural Design Criteria: (8 Hours)
Materials and Structural Design Criteria: Introduction to the analysis and design of structural systems. Analyses of determinate and indeterminate trusses, beams, and frames, and design philosophies for structural engineering. Laboratory experiments dealing with the analysis of determinate and indeterminate structures.

Module IV: Different Types of Structural Elements: (8 Hours)
Design of Structural Elements; Concrete Elements, Steel Elements, Structural Joints; Theories and concepts of both concrete and steel design and analysis both at the element and system levels. Approximate Analysis Methods as a Basis for Design; Design of AICTE Model Curriculum for Undergraduate degree in Civil Engineering (Engineering & Technology) 135 | Page Reinforced Concrete Beams for Flexure; Design of Reinforced Concrete Beams for Shear; Bond, Anchorage, and Serviceability; Reinforced Concrete Columns; Reinforced Concrete Slabs; Introduction to Steel Design; Tension Members and Connections; Bending Members; Structural Systems.

Module V: Prestress Concrete Design: (8 Hours)
System Design Concepts; Special Topics that may be Covered as Part of the Design Project Discussions; Cable Structures; Prestressed Concrete Bridges; Constructability and Structural Control; Fire Protection.

Course Outcome:

- The students will be able to apply their knowledge of structural mechanics in addressing design problems of structural engineering.

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; Att: Attendance

Text & References:

- Nilson, A. H. Design of Concrete Structures. 13th edition. McGraw Hill, 2004
- McCormac, J.C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.
- Galambos, T.V., Lin, F.J., Johnston, B.G., Basic Steel Design with LRFD, Prentice Hall, 1996
- Segui, W. T., LRFD Steel Design, 2nd Ed., PWS Publishing, Boston.
- Salmon, C.G. and Johnson, J.E., Steel Structures: Design and Behavior, 3rd Edition, Harper & Row, Publishers, New York, 1990.
- MacGregor, J. G., Reinforced Concrete: Mechanics and Design, 3rd Edition, Prentice Hall, New Jersey, 1997.

GEOTECHNICAL ENGINEERING

Course Code: CIV 504

Credit Units: 03
Total Hours: 30

Course Objectives:

- The student has basic knowledge about soil and different types of soil based on Indian classification and different soil property.

Course Content

Module I: Introduction–Types of Soils, Their Formation and Deposition: (5 Hours)
Introduction–Types of soils, their formation and deposition, Definitions: soil mechanics, soil engineering, rock mechanics, geotechnical engineering. Scope of soil engineering. Comparison and difference between soil and rock. Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio. porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity.

Module II: Different Soil Properties and Relations: (5 Hours)
Plasticity Characteristics of Soil - Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity. Determination of: liquid limit, plastic limit and shrinkage limit. Use of consistency limits. Classification of Soils-Introduction of soil classification: particle size classification, textural classification, unified soil classification system, Indian standard soil classification system.

Module III: Determination of Coefficient of Permeability: (5 Hours)
Permeability of Soil - Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping- in test, pumping- out test. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil. Seepage Analysis- Introduction, stream and potential functions, characteristics of flow nets.

Module IV: Stresses Coming on Soil Specimen: (5 Hours)
Effective Stress Principle - Introduction, effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.

Module V: Compaction of Soil: (5 Hours)
Compaction of Soil-Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control.

Module VI: Consolidation of Soil: (5 Hours)
Consolidation of Soil - Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation. Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area. Influence factors, Isobars, Boussinesq's equation, Newmark's Influence Chart.

Course Outcome:

- Specify a strategy for site investigation to identify the soil deposits and determine the depth and spatial extent within the ground.

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; Att: Attendance

Text & References:

- Soil Mechanics by Craig R.F., Chapman & Hall
- Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
- An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ 4. Principles of Geotechnical Engineering, by Braja M. Das, Cengage Learning
- Principles of Foundation Engineering, by Braja M. Das, Cengage Learning

EARTHQUAKE RESISTANT DESIGN OF BUILDINGS

Course code: CIV 806

Credit Units: 03
Total Hours: 30

Course Objective:

This course is introduced to foresee the potential consequences of strong earthquakes on urban areas and civil infrastructure. Design, construct and maintain structures to perform at earthquake exposure up to the expectations and in compliance with building codes.

Course Contents:

Module-I: Seismology: (6 Hours)
Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes.

Module-II : Single Degree of Freedom of Structure: (6 Hours)
Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system.

Module-III : Multi-Degree of Freedom of Structure: (6 Hours)
Dynamics of multi degree of freedom system, Idealization of structures, seismic response.

Module-IV: Earthquake Resistant Design of Buildings: (6 Hours)
Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Introduction to earthquake resistant brick and masonry buildings.

Module-V: Design Standards and Machine Foundation: (6 Hours)
Reinforced Concrete framed buildings, Code provisions. Introduction to machine foundation & its design. Degrees of freedom of a block foundation.

Course Outcomes:

- The basics of the subject will help in the development of innovative technique of Seismic analysis and design of structures.
- It will open the new area of project in sensors based Structural Control system.

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; Att: Attendance

Text & References:

- Introduction to Structural Dynamics - J.M. Biggs
- Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
- IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
- Structural Dynamics - Theory & computation - Mario Paz.
- Dynamics of Structures Theory and Applications to Earthquake Engineering - Anil K. Chopra.
- Earthquake Resistant of Design of structures, Agarwal and Srikhande.
- Earthquake Resistant of Design of structures, S.K.Duggal

TRANSPORTATION ENGINEERING

Course Code: CIV 507

Credit Units: 03
Total Hours: 30

Course Objectives:

- Student will get knowledge on various types of highway properties and alignment different types of pavement design and classification of highway and planning of highway design.

Course Contents:

Module I: Highway Planning: (6 Hours)
Highway development and planning-Classification of roads, road development in India, Current road projects in India; highway alignment and project preparation.

Module II: Geometric Properties of Highway: (6 Hours)
Geometric design of highways-: Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems

Module III: Traffic Engineering & Control: (6 Hours)
Traffic engineering & control- Traffic Characteristics, traffic engineering studies, traffic flow and capacity, traffic regulation and control; design of road intersections; design of parking facilities; highway lighting; problems

Module IV: Pavement Design: (6 Hours)
Pavement materials- Materials used in Highway Construction- Soils, Stone aggregates, bituminous binders, bituminous paving mixes; Portland cement and cement concrete: desirable properties, tests, requirements for different types of pavements. Problems

Module V: Flexible and IRC Guidelines: (6 Hours)
Design of pavements- Introduction; flexible pavements, factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements- components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC; problems.

Course Outcome:

- Carry out surveys involved in planning and highway alignment ¬ design the geometric elements of highways and expressways

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; Att: Attendance

Text & References:

- Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017
- Kadiyalai, L.R., ' Traffic Engineering and Transport Planning', Khanna Publishers.
- Partha Chakraborty, ' Principles Of Transportation Engineering, PHI Learning,

NON-DESTRUCTIVE TESTING LAB

Course Code: CIV 826

Credit Units: 01
Total Hours: 10

Course Objective:
This course is deal with the various methods of evaluation of health of existing structures. The various techniques of structural health monitoring will also cover in the NDT lab.

Course Contents:

NOTE: Student will have to perform minimum 3 tests on concrete & two tests on structural steel

1. Non Destructive Testing of reinforced cement concrete **(6 Hours)**
   (a) Strength assessment using rebound hammer
   (b) Quality assessment using ultrasonic puls velocity test
   (c) Strength assessment using pull out method
   (d) Assessment of corrosion of reinforcing bars using half cell potentiometer
   (e) To determine thickness of concrete cover, diameter & spacing of reinforcing bars using rebar scanner.

2. Testing of structural steel **(4 Hours)**
   (a) Testing for corrosion of structural steel
   (b) Assessment of thickness of pipes/tubes/structural steel
   (c) Test for welding performance with Di-penetration test, ultrasonic test & magnetic particle test.

Laboratory Outcomes:

- The basics of the subject will help in the development of innovative technique of rehabilitation of structures.
- It will open the new area for the projects based on "sensors and long terms structural health monitoring".

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; Att: Attendance

Master of Technology
Civil Engineering
(Specialization in Structural Engineering)

Programme Code: CEM

Duration – 2 Years Full Time

Programme Structure
And
Curriculum & Scheme of Examination

2019-21
(Based on AICTE)

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.

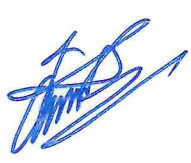
16 January 2019

PROGRAMME STRUCTURE
M.TECH. CIVIL ENGINEERING (Structural Engineering)

FIRST SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per Week**	**Tutorial (T) Hours Per Week**	**Practical (P) Hours Per Week**	**Total Credits**	**Total Hours**
CEM 101	Numerical Analysis and Computer Programming	3	1	-	4	40
CEM 102	Concrete Technology	3	1	-	4	40
CEM 103	Advanced Structural Analysis	3	1	-	4	40
CEM 121	Numerical Analysis and Computer Programming Lab	-	-	4	2	40
CEM 122	Concrete Technology Lab	-	-	4	2	40
CEM 123	Advanced Structural Analysis Lab	-	-	4	2	40
ELECTIVES (Any one from each category)					**4**	**40**
CEM 104	Structural Dynamics And Earthquake Resistant Building	3	1	-	-	-
CEM 105	Bridge Engineering	3	1	-	-	-
CEM 106	Advanced Elasticity And Plasticity	3	1	-	-	-
BCP 141	Advanced Communication – I	1	-	-	1	10
BSP 143	Behavioral Science – I	1	-	-	1	10
FLP 144	French – I	2	-	-	2	20
MTP 130	**Term Paper**	-	-	-	3	-
TOTAL CREDITS					**29**	
Total Hrs per Week					**32**	
Total Hrs in the Semester					**320**	

THIRD SEMESTER						
Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits	Total Hours
CEM 301	Research Methodology	3	1	-	4	40
CEM 302	Advanced RCC Design	3	1	-	4	40
CEM 303	High Rise Buildings Analysis	3	1	-	4	40
CEM 322	Advanced RCC Design Lab	-	-	4	2	40
CEM 324	Building Design Project Lab Using Software	-	-	4	2	40
CEM 325	Structural Material Testing Lab-II	-	-	4	2	40
ELECTIVES (Any one from each category)					**4**	**40**
CEM 306	Analysis of Plates And Shells	3	1	-	-	-
CEM 307	Reliability Based Civil Engineering Design	3	1	-	-	-
CEM 308	Evaluation and Retrofitting of Buildings	3	1	-	-	-
BCP 341	Advanced Communication – III	1	-	-	1	10
BSP 343	Behavioral Science – III	1	-	-	1	10
FLP 344	French– III	2	-	-	2	20
MSP 350	**Summer Internship Programme (SIP)**	-	-	-	6	-
MMP 360	**Minor Project II**	-	-	-	**4**	-
TOTAL CREDITS					**36**	
Total Hrs per Week					**32**	
Total Hrs in the Semester					**320**	

FOURTH SEMESTER						
Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits	Total Hours
MMP 460	**Dissertation (20-22 weeks)**	-	-	-	30	-
TOTAL CREDITS					**30**	-
Total Hrs per Week					-	
Total Hrs in the Semester					-	



Master of Technology

(Civil Engineering)

Programme Code: CEM

Duration – 2 Years Full Time

(2019-21)

OVERALL CREDIT

Sr. No.	Semester	No. of Credits	No. of Hours
1	I	29	32
2	II	30	32
3	III	36	32
4	IV	30	-
Total Credits		**125**	**96**

OPTIMIZATION TECHNIQUES

Course Code PCE 101

Credit Units: 04
Total Hours: 40

Course Objective:
To study the optimization methodologies applied to civil engineering

Course content:

Module I: Linear Programming: (8 Hours)
Solution of LPP by simplex Method, Duality and its solution, Transportation Problem: Initial Solution, Test for Optimality, Unbalanced Transportation Problem, Degeneracy, Alternative Optimal Solutions, Prohibited Transportation, Maximization Transportation Problem Routs, *Assignment Problem*: Introduction, solution by Hungarian Method, Multiple Optimal Solution, Unbalanced Assignment Problem, Maximization Case in Assignment Problem, Restriction on Assignments.

Module II: Game Theory: (8 hours)
Introduction, Two-Person Zero Sum Games, Pure Strategies: Games with Saddle Point, Mixed Strategies: Games without saddle point, Principle of Dominance, Solution Methods for games without saddle point – Algebraic Method, Arithmetic Method, Matrix Method, Graphical Method.

Module III: Queuing Theory: (8 Hours)
Features of Queuing System, Solution of Queuing Models { (MM/1): (∞/FCFS)} Single server, Exponential Service- Unlimited Queue.

Module IV: Simulation: (8 Hours)
Process of simulation, Monte Carlo Simulation, Simulation of an Inventory system, Simulation of Queuing System, Applications of Simulation

Module V: Sequencing: (8 Hours)
Gantt charts, Algorithm for solving sequencing problems: Johnson's Rule, Processing n jobs through 2 machines, processing n jobs through 3 machines, Processing 2 jobs through 'k' machines, Maintenance crew scheduling

Course Outcome:

On completion of this course students will have sufficient knowledge on various optimization techniques like linear programming, non-linear programming, geometric and dynamic programming and they will also in a position to design various structural elements for minimum weight.

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 & Reference:

- S.S. Rao, Optimization: Theory and applications, Wiley Eastern Ltd
- G.V. Reklaitis, Engg. Optimization Methods & applications
- London N.P. Linear Programming, Tata McGraw-Hill
- Sharma J.K. 1997, Operations Research: Theory & Appplicatinos, Mac Millan India Ltd.
- Grobner D.F. & Shannon P.W., Essential of Business Statistics: A Decision Making Approach, MacMillan College Publishing Co.

FOUNDATION ENGINEERING

Course Code: PCE 102

Credit Units: 04
Total Hours: 40

Course Objective:
To Understand the bearing capacity of shallow and deep foundation, to estimate the settlement of structures subjected to external loads, testing to design of foundation resting on soils.

Course Content:

Module I: Soil Explorations: (8 Hours)

Soil Exploration: Introduction, Methods of exploration, Direct Methods and techniques of exploration, Methods of boring types of samples, Disturbance of soil sample, Soil samplers and sampling techniques, Ground water observations, Boring records, Spacing and depth of bore holes, Indirect methods of soil exploration, Penetration tests, Geophysical methods, Dynamics methods, Sequence of exploration programs

Module II: Shallow foundations: (8 Hours)
Shallow Foundations: Introduction, General Requirements, Depth of foundation, Bearing capacity, Eccentric Inclined loads, Bearing capacity of stratified soils, Settlement of footings, Settlement of footings from constitutive laws, Settlement and tilt of eccentrically loaded footings, Allowable settlement, Plate bearing test, Standard penetration test Effect of water table, shallow foundation classification, Modulus of sub-grade reaction, Beams on elastic foundation, Raft foundation.

Module III: Deep Foundations: (8 Hours)
Pile Foundation: Introduction, Uses of piles, Types of piles, pile drivers, Bearing capacity of piles, Static analysis, Pile load test, Dynamic methods, Other methods, 24 Negative skin friction, Pile group, Ultimate bearing capacity of pile groups, Settlement of pile group, Influence of pile cap. Laterally loaded piles, Ultimate resistance, Elastic methods, Pile groups under lateral load, batter pile under lateral load, Batter pile groups under inclined loads, pile under dynamic loads.

Module IV: Coffer Dams: (8 Hours)
Coffer Dams: Introduction, types of Coffer Dams, Design data for cellular cofferdam, Stability analysis of cofferdam, Interlock stresses.

Module V: Machine Foundations: (8 Hours)
Introduction, Criteria for satisfactory action of a machine foundation, Definitions, Degrees of freedom of a block foundation, Analysis of block foundation, Theory of linear weightless spring, Equivalent soil springs, Vertical vibration, Rocking vibration, Vibration in shear, Simultaneous rocking sliding and vertical vibrations for a foundation, Indian standard on design and construction of foundations for reciprocating machines, Foundations for impact type machines, Indian Standard on design and construction of foundations for impact type machines, Analysis of block foundation based on elastic half space theory.

Course Outcomes:

- Students should be in position to design foundation for varieties of the structures resting on soils.

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:

- Bowles, Foundation: Analysis and Design, McGraw Hill Book CO. Inc.
- Peck , R.B. , W.E. Hanson and T.H. Thornburn, Foundation Engineering, Wiley , New York

SMART MATERIALS AND TECHNIQUES

Course Code: PCE 103

Credits Units: 04
Total Hours: 40

Course Objectives:

To make the students to gain the knowledge on strain measuring techniques, smart materials and signal processing and control systems.

Course Contents:

Module-I: Introduction to smart materials and sensing systems: (8 Hours)

Introduction to Intelligent buildings - Basic concepts – Intelligent building automation - Building automation system - Cost analysis of intelligent buildings – Introduction to smart materials. Instrumented Structures Functions and Response– Sensing systems – Self-diagnosis – Signal processing consideration – Actuation systems and effectors.

Module-II: Actuator techniques: (8 Hours)

Actuator and actuator materials – Piezoelectric and Electro strictive Material – Magneto structure Material – Shape Memory Alloys – Electrorheological Fluids– Electromagnetic actuation – Role of actuators and Actuator Materials.

Module- III: Nano-materials for "green" systems: (8 Hours)

Green materials, including biomaterials, biopolymers, bioplastics, and composites Nanotech Materials for Truly Sustainable Construction: Windows, Skylights, and Lighting. Paints, Roofs, Walls, and Cooling. Multifunctional Gas Sensors, Biomimetic Sensors, Optical Interference Sensors Thermo-, light-, and stimulus-responsive smart materials Nanomaterials. Polymer Membranes- Coatings-Adhesives, Non - Weathering Materials-Flooring and Facade Materials- Glazed Brick, Photo Catalytic Cement, Acid Etched Copper And Composite Fiber.

Module-IV: Building Systems: (8 Hours)

Lighting – day lighting; ventilation – natural ventilation; indoor air quality; heating/cooling – geothermal; passive and active systems for energy production and conservation; water conservation – grey water reuse, water saving plumbing fixtures.

Module-V: Building Electronics: (8 Hours)

Introduction - Microprocessor based control - Programmable logic controller – Communication principles - Telephone systems - Communal aerial broadcasting - Satellite communication – Fibre optic system.

Course Outcomes:

- Able to explain the functions and response of instrumented structures and measurement of strain using electrical strain gauges.
- Able to know the various smart materials such as sensors and actuators.
- Able to know about the control systems for smart structures.

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:

- Brain Culshaw – Smart Structure and Materials Artech House – Borton. London-1996. 2. Srinivasan ,A.V and Michael McFarland . D, "Smart Structures – Analysis and Design, Cambridge University Press, 2001.
- Yoseph Bar Cohen, "Smart Structures and Materials", The International Society for Optical Engineering2003.
- L. S. Srinath, "Experimental Stress Analysis", Tata McGraw Hill, 2004.
- J. W. Dally & W. F. Riley,"Experimental Stress Analysis", Tata McGraw Hill Company

EARTHQUAKE RESISTANT DESIGN OF STRUCTURE

Course Code: PCE 104

Credit Units: 04
Total Hours: 40

Course Objective:
This course is introduced to foresee the potential consequences of strong earthquakes on urban areas and civil infrastructure. Design, construct and maintain structures to perform at earthquake exposure up to the expectations and in compliance with building codes.

Course Content:

Module I: Seismology: (8 Hours)
Internal structure of earth causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes.

Module II: Single Degree of Freedom: (8 Hours)
Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system,

Module III: Multi-Degree of Freedom: (8 Hours)
Dynamics of multi degree of freedom system, Idealization of structures, seismic response

Module IV: Methods of Seismic Analysis: (8 Hours)
Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Introduction to earthquake resistant brick and masonry buildings.

Module V: Building Control System: (8 Hours)
Structural control system : Base Isolation, Passive Control, Active control, Semi- Active control and Hybrid System.

Course Outcomes:

- The basics of the subject will help in the development of innovative technique of Seismic analysis and design of structures.
- It will open the new research area of "sensors based Structural Control system".

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:

- Introduction to Structural Dynamics - J.M. Biggs
- Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
- IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
- Structural Dynamics - Theory & computation - Mario Paz.
- Dynamics of Structures Theory and Applications to Earthquake Engineering - Anil K. Chopra.
- Earthquake Resistant of Design of structures, Agarwal and Srikhande.
- Earthquake Resistant of Design of structures, S.K.Duggal

STRUCTURAL HEALTH MONITORING

Course Code: PCE 105

Credit Units: 04
Total Hours: 40

Course Objective:
This course is deal with the various methods of evaluation of health of existing structures. The various techniques of structural health monitoring will also be covered in this subject.

Course Content:

Module-I: Maintenance: Repair and rehabilitation: (8 Hours)
Facts of maintenance, importance of maintenance. Various aspects of inspection, assessment procedure for evaluating damaged structure, causes of deterioration. Repair Strategies: Causes of distress in concrete structures, construction and design failures, condition assessment and distress-diagnostic techniques, assessment procedure for inspection and evaluating a damaged structure.

Module-II: Serviceability and Durability of Concrete: (8 Hours)
Quality assurance for concrete construction, concrete properties – strength, permeability, thermal properties and cracking. effects due to climate, temperature, chemicals, corrosion.

Module-III: Materials and Techniques for Repair: (8 Hours)
Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, expansive cement, polymer concrete, sulphur infiltrated concrete, ferro-cement, fibre reinforced concrete, bacterial concrete, rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, gunite and shotcrete, epoxy injection, mortar repair for cracks, shoring and underpinning.

Module-IV: Repair, Rehabilitation and Retrofitting Techniques: (8 Hours)
Repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure. Repair of structure: Common types of repairs repair in concrete structures, repairs in under water structures. Strengthening of Structures: Strengthening Methods, retrofitting, Jacketing.

Module-V: Health Monitoring and Demolition Techniques: (8 Hours)
Long term health monitoring techniques, engineered demolition techniques for dilapidated structures, use of sensors for building instrumentation.

Course Outcomes:

- The basics of the subject will help in the development of innovative technique of rehabilitation of structures.
- It will open the new research area of "sensors based long terms structural health monitoring".

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

Texts & References:

- Concrete Technology by A.R. Santakumar, Oxford University press
- Defects and Deterioration in Buildingts, E F & N Spon, London
- Non-Destructive Evaluation of Concrete Structures by Bungey - Surrey University
- Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
- Concrete Repair and Maintenance Illustrated, RS Means Company Inc W. H. Ranso, (1981)
- Building Failures : Diagnosis and Avoidance, EF & N Spon, London, B .
- Mehta, P.K and Montevic. P.J., Concrete- Microstructure, Properties and Materials, ICI, 1997.,
- Jackson, N., Civil Engineering Materials, ELBS, 1983.

ADVANCED GEOTECHNICAL ENGINEERING

Course code PCE 106

Credit Units: 04
Total Hours: 40

Course Objectives:
To understand the physical and engineering properties of soil and its behavior under external loads and for different site conditions. To determine the bearing capacity of shallow and deep foundations, to estimate settlements of structures subjected to external loads, leading to design of foundations resting on soils.

Course Contents:

Module-I: Soil Structures and its Properties: (8 Hours)
Structure and composition of soil & clay minerals, effect of clay minerals on engineering properties, mechanics of expansive soil.

Module-II: Concept of Plain Stress and Strain in Soil Mechanics: (8 Hours)
Plane stress and plane strain problems as applied to geotechnical engineering. Concentrated and distributed line loads: Boussinesq's equation and Westergaards's solution. Vertical pressure line and strip loads and loaded circular and rectangular areas. Limitations of elastic formulae for soils.

Module-III: Concept of Elastic and Plastic State of Soil: (8 Hours)
General states of plastic equilibrium. Dubrova's lateral earth pressure theories, Brinch-Hansens theory. Shear strength of cohesion less and cohesive soils, effective stress principle. Theory of consolidation, Time rate of consolidation, 3-D consolidation, immediate and ultimate settlements.

Module-IV: Site investigation & exploration: (8 Hours)
location, depth of bore holes and bore log chart. Shallow foundations, Bearing capacity theories, settlement. I.S. Code on structural safety of foundations Allowable total and differential settlements. Load Tests : Indian standard specification on Load Tests. Contact Pressure distribution.

Module-V: Pile Foundation: (8 Hours)
Type of Piles, Allowable load on pile load test, Dynamic Formula, Static Formula. Pile Groups in sand and clays-settlement and bearing capacity I.S.Codes of piles. Behavior of pile under lateral loading-Winkler's assumptions, and Theory of beam on elastic foundations. Batter pile-methods of analysis.

Course Outcomes:
Students will be able to understand the soil behavior under external loads, and procedures to measure relevant soil parameters. Students should be in a position to design foundations for varieties of structures resting on soil deposits and appreciate the importance of reliability based design in geotechnical engineering.

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

- Advanced Geotechnical Engg. – Alam Singh, pub. CBS Publishers and Distributors.
- Theoretical Soil Mechanics- M. E. Harr, pub. Tata McGraw-Hill.
- Theoretical Soil Mechanics -Jumikis, pub. R.E. Krieger Pub.
- Theoretical Soil Mechanics -Terzagi, pub. John Wiley & Sons.
- Foundation Design and Construction – Tomilson, pub. Longman Group, UK.
- Foundation Analysis and Design - J. E. Bowles, pub. Tata McGraw-Hill.
- Analysis and Design of Sub structures - Swami Saran, pub. Oxford & Ibh Publications.
- Design Aid in Soil Mechanics and Foundation Engineering- Kaniraj, pub. McGraw-Hill Publications.
- Design of Foundation System – Kurian, pub. Alpha Science International.

STRUCTURAL HEALTH MONITORING

Course Code: PCE 105

Credit Units: 04
Total Hours: 40

Course Objective:
This course is deal with the various methods of evaluation of health of existing structures. The various techniques of structural health monitoring will also be covered in this subject.

Course Content:

Module-I: Maintenance: Repair and rehabilitation: (8 Hours)
Facts of maintenance, importance of maintenance. Various aspects of inspection, assessment procedure for evaluating damaged structure, causes of deterioration. Repair Strategies: Causes of distress in concrete structures, construction and design failures, condition assessment and distress-diagnostic techniques, assessment procedure for inspection and evaluating a damaged structure.

Module-II: Serviceability and Durability of Concrete: (8 Hours)
Quality assurance for concrete construction, concrete properties – strength, permeability, thermal properties and cracking. effects due to climate, temperature, chemicals, corrosion.

Module-III: Materials and Techniques for Repair: (8 Hours)
Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, expansive cement, polymer concrete, sulphur infiltrated concrete, ferro-cement, fibre reinforced concrete, bacterial concrete, rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, gunite and shotcrete, epoxy injection, mortar repair for cracks, shoring and underpinning.

Module-IV: Repair, Rehabilitation and Retrofitting Techniques: (8 Hours)
Repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure. Repair of structure: Common types of repairs repair in concrete structures, repairs in under water structures. Strengthening of Structures: Strengthening Methods, retrofitting, Jacketing.

Module-V: Health Monitoring and Demolition Techniques: (8 Hours)
Long term health monitoring techniques, engineered demolition techniques for dilapidated structures, use of sensors for building instrumentation.

Course Outcomes:

- The basics of the subject will help in the development of innovative technique of rehabilitation of structures.
- It will open the new research area of "sensors based long terms structural health monitoring".

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

Texts & References:

- Concrete Technology by A.R. Santakumar, Oxford University press
- Defects and Deterioration in Buildingts, E F & N Spon, London
- Non-Destructive Evaluation of Concrete Structures by Bungey - Surrey University
- Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
- Concrete Repair and Maintenance Illustrated, RS Means Company Inc W. H. Ranso, (1981)
- Building Failures : Diagnosis and Avoidance, EF & N Spon, London, B .
- Mehta, P.K and Montevic. P.J., Concrete- Microstructure, Properties and Materials, ICI, 1997.,
- Jackson, N., Civil Engineering Materials, ELBS, 1983.

FINITE ELEMENT METHODS

Course Code PCE 107

Credit Units: 04
Total Hours: 40

Course Objective:
This course is deal with the basic fundamental of FEM which enables the user to virtually test and predict the behavior of structures in addition to solving complex civil engineering problems.

Course Content:

Module-I: Calculus of variation: (8 Hours)
Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principal of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis.

Module-II: FEM Procedure: (8 Hours),
Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates. Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equations by Galerkin's method, Solving cantilever beam problem by Galerkin's approach, Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrila1teral elements.

Module-III: Higher order Elements: (8 Hours)
Concept of iso-parametric elements, Concept of sub-parametric and super - parametric elements, Concept of Jacobin matrix. Numerical Integration: Numerical Integration, one point formula and two point formula for 2D formula, Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes.

Module-IV: Shape Function and its Application: (8 Hours)
Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermitian shape functions.
Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy invariance,
Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, Direct method for deriving shape functions using Langrage's formula, Plane stress problems.

Module-V: Application of FEM in Structural Analysis: (8 Hours)
Analysis of Beam, Frames, Truss, and Plates subjected to various types of loads.

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; Att: Attendance

Course Outcomes:

- To understand the use of basic finite elements for structural applications using truss, beam, frame and plates.
- It will open the new research area of "Finite element based analysis and design of complicated structures.

Text & References:

- The Finite Element method -ZIENKIEWICZ.O.C.Tata McGraw Hill Pub. New Delhi, 2000
- Finite Element Methods by C R Alaval , PHI
- Finite Elements in Engineering:- Chandrupatta, et. AI. Prentice Hall of India Pvt. Ltd.,
- Finite element method with application in engineering by Chandrupatla & Belegundu, Pearson
- Publication. 5. Finite Element Method Basics concept & Applications by Alawala
- Fundamental of Finite element Analysis by Devid V. hutton
- Finite element Methods is fundamentals an application in engineering by Chen Z
- Reference:Concepts and Applications of Finite Element Analysis: COOK. D. Robert. Malus.S.David, Plesha
- E. Michel, John wilely & sons 3rd Edn. New York, 2000
- Finite Element Analysis -C.S. Krishnanmoorthy, Tata McGraw Hill Publishing Co. Ltd, New Delhi,

Bachelor of Technology
(Civil Engineering)

CIV

AICTE MODEL CURRICULUM

(2019-23 Batch)

Bachelor of Technology
(Civil Engineering)

Programme Code: CIV

Duration – 4 Years Full Time

Programme Structure
&
Curriculum & Scheme of Examination

2019-23
(Based on AICTE)

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 different codes used for the components of evaluation are given below:-

Components	**Codes**
Case Discussion/ Presentation/ Analysis	C
Home Assignment	H
Project	P
Seminar	S
Viva	V
Quiz	Q
Class Test	CT
Attendance	A
End Semester Examination	ESE

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.

April, 2019

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.

FIRST SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
MAT 101	Applied Mathematics – I (Calculus and Linear Algebra)	3	1	-	4	40
CHE 101	Applied Chemistry	3	1	-	4	40
ECE 101	Basic Electrical Engineering	3	-	-	3	30
BME 101	Engineering Graphics & Design	1	-	-	1	10
CHE 121	Applied Chemistry Lab	-	-	2	1	20
ECE 121	Basic Electrical Engineering Lab	-	-	2	1	20
BME 121	Engineering Graphics & Design Lab	-	-	4	2	40
BCU 141	Communication Skills – I	1	-	-	1	10
EVS 142	Environmental Studies – I	2	-	-	2	20
BSU 143	Behavioural Science – I	1	-	-	1	10
FLU 144	French – I	2	-	-	2	20
CBCS		3	-	-	3	30
TOTAL CREDITS (Including CBCS)					**25**	
Total Hours Including CBCS per week					**29**	
Total Hours in the Semester					**290**	

SECOND SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
MAT 201	Applied Mathematics – II (Ordinary & Partial Differential Equations and Transform)	3	1	-	4	40
PHY 101	Applied Physics – I	3	1	-	4	40
CSE 104	Programming for Problem Solving	3	-	-	3	30
BME 102	Workshop/ Manufacturing Practices	1	-	-	1	10
PHY 121	Applied Physics Lab – I	-	-	2	1	20
CSE 124	Programming for Problem Solving Lab	-	-	4	2	40
BME 122	Workshop/ Manufacturing Practices Lab	-	-	4	2	40
BCU 241	Communication Skills – II	1	-	-	1	10
EVS 242	Environmental Studies – II	2	-	-	2	20
BSU 243	Behavioural Science – II	1	-	-	1	10
FLU 244	French – II	2	-	-	2	20
CBCS		3	-	-	3	30
TOTAL CREDITS (Including CBCS)					**26**	
Total Hours Including CBCS					**31**	
Total Hours in the Semester					**310**	
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**	**Hours**
MAT 301	Applied Mathematics- III (Probability, Statistics and Numerical Methods)	3	-	-	3	30
CIV 302	Computer-Aided Civil Engineering Drawing	2	-	-	2	20
CIV 303	Engineering Mechanics	3	1	-	4	40
CIV 304	Energy Science & Engineering	1	1	-	2	20
CIV 305	Basic Civil Engineering	2	-	-	2	20
BME 104	Mechanical Engineering	2	-	-	2	20
ECE 307	Basic Electronics	2	-	-	2	20
CIV 306	Biology for Engineers	2	-	-	2	20
CIV 307	Life Science	2	-	-	2	20
CIV 322	Computer-aided Civil Engineering Drawing Lab	-	-	2	1	20
ECE 327	Basic Electronics Lab	-	-	2	1	20
BCU 341	Communication Skills – III	1	-	-	1	10
BSU 343	Behavioural Science – III	1	-	-	1	10
FLU 344	French – III	2	-	-	2	20
NTP 330	**Term paper (Evaluation)**	-	-	-	2	
CBCS		3	-	-	3	30
TOTAL CREDITS (Including CBCS)					**32**	
Total Hours. including CBCS					**32**	
Total Hours in the Semester					**320**	

FOURTH SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
CIV 401	Materials, Testing & Evaluation	2	-	-	2	20
CIV 402	Engineering Geology	2	-	-	2	20
CIV 403	Surveying	1	1	-	2	20
CIV 404	Fluid Mechanics	2	-	-	2	20
CIV 405	Solid Mechanics	2	-	-	2	20
CIV 406	Disaster Preparedness & Planning	1	1	-	2	20
CIV 407	Civil Engineering - Societal & Global Impact	1	1	-	2	20
ECE 407	Instrumentation & Sensor Technologies for Civil Engineering Applications	2	-	-	2	20
CIV 421	Materials Testing and Evaluation Lab	-	-	2	1	20
CIV 422	Engineering Geology Lab	-	-	2	1	20
CIV 423	Surveying lab	-	-	2	1	20
CIV 424	Fluid Mechanics Lab	-	-	2	1	20
ECE 427	Instrumentation & Sensor Technologies for Civil Engineering Applications Lab	-	-	2	1	20
BCU 441	Communication Skills – IV	1	-	-	1	10
BSU 443	Behavioural Science – IV	1	-	-	1	10
FLU 444	French – IV	2	-	-	2	20
CBCS		3	1	-	4	40
TOTAL CREDITS (Including CBCS)					**29**	
Total Hours including CBCS					**34**	
Total Hours in the Semester					**340**	
INDUSTRIAL 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**	**Hours**
CIV 501	Mechanics of Materials	3	-	-	3	30
CIV 502	Hydraulic Engineering	2	-	-	2	20
CIV 503	Structural Engineering	3	-	-	3	30
CIV 504	Geotechnical Engineering	2	-	-	2	20
CIV 505	Hydrology & Water Resources Engineering	3	-	-	3	30
CIV 506	Environmental Engineering – I	3	-	-	3	30
CIV 507	Transportation Engineering	2	-	-	2	20
CIV 522	Hydraulic Engineering Lab	-	-	2	1	20
CIV 524	Geotechnical Engineering Lab	-	-	2	1	20
CIV 527	Transportation Engineering Lab	-	-	2	1	20
BCU 541	Communication Skills – V	1	-	-	1	10
BSU 543	Behavioural Science – V	1	-	-	1	10
FLU 544	French – V	2	-	-	2	20
NPT 550	**Industrial Practical Training I (Evaluation)**	-	-	-	3	-
CBCS		3	1	-	4	40
TOTAL CREDIT (Including CBCS)					**32**	
Total Hours including CBCS					**32**	
Total hours in semester					**320**	

SIXTH SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
CIV 601	Construction Engineering & Management	2	1	-	3	30
CIV 602	Geometric Design of Highways	3	-	-	3	30
CIV 603	Environmental Engineering – II	3	-	-	3	30
CIV 604	Estimating and Costing	2	-	-	2	20
CIV 622	Geometric Design of Highways Lab	-	-	2	1	20
CIV 623	Environmental Engineering – II Lab	-	-	2	1	20
CIV 624	Estimating and Costing Lab	-	-	2	1	20
ELECTIVES (Any one from following with Practical)					**4**	**50**
CIV 605	River Engineering	3	-	-	-	-
CIV 606	Open Channel Flow	3	-	-	-	-
CIV 607	Solid and Hazardous Waste Management	3	-	-	-	-
CIV 625	River Engineering Lab	-	-	2	-	-
CIV 626	Open Channel Flow Lab	-	-	2	-	-
CIV 627	Solid and Hazardous Waste Management Lab	-	-	2	-	-
BCH 620	Engineering Economics	2	1		3	30
BCU 641	Communication Skills – VI	1	-	-	1	10
BSU 643	Behavioural Science – VI	1	-	-	1	10
FLU 644	French – VI	2	-	-	2	20
NMP 660	**Minor Project**	-	-	-	2	-
CBCS		-	-	-	1	-
TOTAL CREDIT (Including CBCS)					**28**	
Total Hours per week					**29**	
Total hours in semester					**290**	
INDUSTRIAL PRACTICAL TRAINING II: 6-8 WEEKS						

SEVENTH SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
CIV 701	Design of Concrete Structures	3	1		4	40
ELECTIVES (Any one from each category) A. (With Practical)					4	50
CIV 702	Surface Hydrology	3	-	-	-	-
CIV 703	Water Resources Field Methods	3	-	-	-	-
CIV 704	Environmental Fluid Mechanics	3	-	-	-	-
CIV 722	Surface Hydrology Lab	-	-	2	-	-
CIV 723	Water Resources Field Methods Lab	-	-	2	-	-
CIV 724	Environmental Fluid Mechanics Lab	-	-	2	-	-
ELECTIVES (Any one from each category) B. (Without Practical)					3	30
CIV 705	Concrete Technology	3	-	-	-	-
CIV 706	Pres-stressed Concrete	3	-	-	-	-
CIV 707	Masonry Structures	3	-	-	-	-
BCU 741	Communication Skills – VII	1	-	-	1	10
BSU 743	Behavioural Science – VII	1	-	-	1	10
FLU 744	French – VII	2	-	-	2	20
NPT 750	**Industrial Practical Training–II (Evaluation)**	-	-	-	5	-
NMP 760	**Major Project – I**	-	-	-	6	-
TOTAL CREDIT					**26**	
Total hours per week					**16**	
Total hours in semester					**160**	

EIGHTH SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
CIV 801	Design of Steel Structures	3	1	-	4	40
CIV 802	Airport Planning and Design	3	-	-	3	30
ELECTIVES (Any one from following with Practical)					4	50
CIV 803	Foundation Engineering	3	-	-	-	-
CIV 804	Structural Geology	3	-	-	-	-
CIV 805	Rock Mechanics	3	-	-	-	-
CIV 823	Foundation Engineering Lab	-	-	2	-	-
CIV 824	Structural Geology Lab	-	-	2	-	-
CIV 825	Rock Mechanics Lab	-	-	2	-	-
BCU 841	Communication Skills – VIII	1	-	-	1	10
BSU 843	Behavioral Science – VIII	1	-	-	1	10
FLU 844	French – VIII	2	-	-	2	20
NMP 860	**Major Project – II**	-	-	-	9	-
TOTAL CREDIT					**24**	
Total hours per week					**16**	
Total hours in semester					**160**	

Bachelor of Technology
(Civil Engineering)

Programme Code: CIV

Duration – 4 Years Full Time
(2019-23)

OVERALL CREDIT

Sr. No.	Semester	No. of Credits	No. of Hours
1	I	25	29
2	II	26	31
3	III	32	32
4	IV	29	34
5	V	32	32
6	VI	28	29
7	VII	26	16
8	VIII	24	16
Total Credits		**222**	**219**

ENERGY SCIENCE & ENGINEERING

Course Code: CIV 304

Credit Units : 02
Total Hours : 20

Course Objective:
The objective of this Course is to provide an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application. The class will explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternatives, renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, geothermal, ocean thermal, hydro and nuclear. Energy conservation methods will be emphasized from Civil Engineering perspective. The knowledge acquired lays a good foundation for design of various civil engineering systems/ projects dealing with these energy generation paradigms in an efficient manner.

Course Contents:

Module I: Introduction to Energy Science: (4 Hours)
Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment.

Module II: Energy Sources: (4 Hours)
Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries).

Module III: Energy & Environment: (4 Hours)
Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy.

Module IV: Civil Engineering Projects connected with the Energy Sources: (4 Hours)
Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems

Module V: Engineering for Energy conservation: (4 Hours)
Concept of Green Building and Green Architecture, Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption.

Course Outcomes:

- List and generally explain the main sources of energy and their primary applications nationally and internationally
- Have basic understanding of the energy sources and scientific concepts/principles behind them
- Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.
- List and describe the primary renewable energy resources and technologies.
- To quantify energy demands and make comparisons among energy uses, resources, and technologies.
- Collect and organize information on renewable energy technologies as a basis for further analysis and evaluation.
- Understand the Engineering involved in projects utilising these sources

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; Att: Attendance

Text & References:

- Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
- Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press
- Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
- Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,
- Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
- UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
- E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company
- Related papers published in international journals

B.Tech. CE 2019-23 (Based on AICTE)

BASIC CIVIL ENGINEERING

Course Code: CIV 305

Credit Units: 02
Total Hours: 20

Course Objective:

To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering. To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness. To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.

Course Contents:

Module-I: Basic Understanding: (4 Hours)

What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career. Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers.

Module-II: Fundamentals of Architecture & Town Planning: (4 Hours)

Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities.

Module-III: Fundamentals of Building Materials: (4 Hours)

Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes. Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies.

Module-IV: Environmental Engineering & Sustainability: (4 Hours)

Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction; **Geotechnical Engineering:-**(Basics of soil mechanics, rock mechanics and geology; various types of foundations) **Hydraulics, Hydrology &Water Resources Engineering:** (Fundamentals of fluid flow, basics of water supply systems; Underground Structures)

Module-V: Surveying & Geometrics: (2 Hours)

Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR. **Traffic &Transportation Engineering:** (Development in India for different modes of transport; Developments and challenges in integrated transport development in India: road, rail, port and harbour and airport sector; PPP in transport sector; Intelligent Transport Systems; Urban Public and Freight Transportation; Road Safety under heterogeneous traffic; Sustainable and resilient pavement materials)

Module-VI: Repairs & Rehabilitation of Structures: (2 Hours)

Basics of corrosion phenomena and other structural distress mechanisms; some simple systems of rehabilitation of structures; Non- Destructive testing systems; Use of carbon fibre wrapping and carbon composites in repairs. Typical software used in Civil Engineering- Finite Element Method, Modelling; highlighting typical available software systems (SAP, STAAD, ABAQUS, MATLAB, ETAB, REVIT, AUTOCAD, PRIMAVERA)

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

Course Outcomes:

- Introduction to what constitutes Civil Engineering
- Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering
- Highlighting the depth of engagement possible within each of these areas
- Exploration of the various possibilities of a career in this field
- Understanding the vast interfaces this field has with the society at large
- Providing inspiration for doing creative and innovative work
- Showcasing the many monuments, heritage structures, nationally important infrastructure, and impressive projects to serve as sources of inspiration
- Highlighting possibilities for taking up entrepreneurial activities in this field
- Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering

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; Att: Attendance

Text & References:

- Patil, B.S.(1974), Legal Aspects of Building and Engineering Contract
- The National Building Code, BIS, (2017)
- RERA Act, (2017)
- Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
- Chandiramani, Neelima (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
- Avtarsingh (2002), Law of Contract, Eastern Book Co.
- Dutt (1994), Indian Contract Act, Eastern Law House
- Anson W.R.(1979), Law of Contract, Oxford University Press
- Kwatra G.K.(2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
- Avtarsingh (2005), Law of Arbitration and Conciliation, Eastern Book Co.
- Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.
- P. S. Narayan (2000), Intellectual Property Rights, Gogia Law Agency
- T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
- Bare text (2005), Right to Information Act
- O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
- K.M. Desai(1946), The Industrial Employment (Standing Orders) Act
- Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House
- Vee, Charles & Skitmore, Martin (2003) Professional Ethics in the Construction Industry, Engineering Construction and Architectural management, Vol.10, Iss. 2, pp 117-127, MCB UP Ltd
- American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study and Application
- Ethics in Engineering- M.W.Martin& R.Schinzinger, McGraw-Hill

B.Tech CE 2019-23 (Based on AICTE)

BIOLOGY FOR ENGINEERS

Course Code: CIV 306

Credit Units: 02
Total Hours: 20

Course Objectives

To gain knowledge of the subject biology, its importance, to provide basic knowledge about plant physiology, ecology, ecosystems, population ecology, environmental management, protection Acts & elementary principles of biostatical methods & tools.

Course Contents:

Module I: Why we need to study biology? (5 Hours)

To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry Bring out the fundamental differences between science and engineering. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries.

Module II: Plant Physiology: (3 Hours)

Transpiration; Mineral nutrition

Module III: Ecology, Ecosystems & Population Ecology: (6 Hours)

Components, types, flow of matter and energy in an ecosystem; Community ecology- Characteristics, frequency, life forms, and biological spectrum; Ecosystem structure- Biotic and a-biotic factors, food chain, food web, ecological pyramids.

Population characteristics, ecotypes; Population genetics- Concept of gene pool and genetic diversity in populations, polymorphism and heterogeneity;

Module IV: Environmental Management: (3 Hours)

Perspectives concerns and management strategies; Policies and legal aspects- Environment Protection Acts and modification, International Treaties; Environmental Impact Assessment- Case studies (International Airport, thermal power plant)

Module V: Introduction to Biostatistics: (3 Hours)

Terms used, types of data; Measures of Central Tendencies- Mean, Median, Mode, Normal and Skewed distributions; Analysis of Data- Hypothesis testing and ANNOVA (single factor)

Course outcome:

After completion of this course students will be able to understand

- The significance of biological sciences
- Develop an understanding of the ecosystems, community ecology, ecosystem structure etc.
- Understand the concept of population characteristics, ecotypes; population genetics.
- Develop an insight into the various environmental management covering principles environment protection Acts. Environmental Impact Assessment
- Understanding the concept of biostatical analysis which will provide a foundation for laboratory & fieldworks.

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; Att: Attendance

Text & References:

- Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd.
- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopedia,Jaico Publ.House,Mumabai, 1196p
- Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House,Delhi 284 p. Mckinney, M.L. &School, R.M. 1996.Environmental Science Systems &Solutions, Web enhanced edn. 639p

LIFE SCIENCE

Course Code: CIV 307

Credit Units: 02
Total Hours: 20

Course Objective:
To understand cellularity in structural development, classification of species, the metabolism processes Elementary principles of genetics, Structures of DNA and RNA, Molecular genetics, Biostatistics, Biotechnology.

Course Contents:

Module I: Unicellular or Multicellular: (5 Hours)
Classification per se is not what biology is all about (The underlying criterion, such as morphological, biochemical or ecological be highlighted). Hierarchy of life forms at phenomenological level. Classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitats- acquatic or terrestrial.

Module II: Concepts of Recessiveness and Dominance: (5 Hours)
Principles of Genetics in biology are like Newton's laws to Physical Sciences. Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis (be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring). Concepts of recessiveness and dominance. Concept of mapping of phenotypes to genes. Single gene disorders in humans. Concept of complementation using human genetics.

Module III: Molecules of Life: (5 Hours)
All forms of life has the same building blocks (yet the manifestations are as diverse as one can imagine Molecules of life). Discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins, Lipids. Nucleotides and DNA/RNA.

Module IV: Molecular Genetics: (2 Hours)
Structures of DNA and RNA; Concept of Gene, Gene regulation, e.g., Operon concept;

Module V: Basic Concepts of Biotechnology: (3 Hours)
Totipotency and Cell manipulation; Plant & Animal tissue culture- Methods and uses in agriculture, medicine and health; Recombinant DNA Technology- Techniques and applications;

Course Outcomes:

After completion of this course students will be able to understand

- Cellular structures of living forms.
- Classification of biology and biomolecule
- About metabolism and Enzimes
- About DNA and biological structure
- About the species
- Exploring Molecular Genetics
- Understand the basic principles & techniques of biotechnology.

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; Att: Attendance

Text & References:

- Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd
- Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H. John Wiley and Sons
- Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
- Molecular Genetics (Second edition), Stent, G. S.; and Calender, R. W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
- Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

B.Tech. CE (2019-23) (Based on AICTE)

MECHANICS OF MATERIALS (Removed)

Course Code: CIV 501

Credit Units: 03
Total Hours: 30

Course Objectives:

The course is designed to provide and train students of mechanics of materials. The course will introduce students to various material properties, mechanics under different loading condition etc.

Course Contents:

The objective of this Course is to introduce to continuum mechanics and material modeling of engineering materials based on first energy principles.

Module I: Introduction to Stress and Strain: (8 Hours)
Deformation and Strain covering description of finite deformation, Infinitesimal deformation; Analysis of statically determinate trusses; Stability of dams, retaining walls and chimneys; Stress analysis of thin, thick and compound cylinder.

Module II: Failure Theories: (7 Hours)
Generalized state of stress and strain: Stress and strain tensor, Yield criteria and theories of failure; Tresca, Von-Mises, Hill criteria, Heigh-Westerguard's stress space.

Module III: Bending Moments Diagrams: (5 Hours)
Momentum Balance and Stresses covering Forces and Moments Transmitted by Slender Members, Shear Force and Bending Moment Diagrams, Momentum Balance, Stress States / Failure Criterion.

Module IV: Determinacy and Indeterminacy of Structures: (5 Hours)
Mechanics of Deformable Bodies covering Force-deformation Relationships and Static Indeterminacy, Uniaxial Loading and Material Properties, Trusses and Their Deformations, Statically Determinate and Indeterminate Trusses,

Module V: Pressure Vessels and Torsion: (5 Hours)
Force-Stress-Equilibrium covering Multiaxial Stress and Strain, Thin-walled Pressure Vessels,Stress and strain Transformations and Principal Stress, Failure of Materials. Statically Indeterminate Beams, Shear and Torsion, Torsion and Twisting.

Course Outcome:

- Understand the deformation and strains under different load action and response in terms of forces and moments
- Understand the behaviour under different loading actions

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; Att: Attendance

Text &References:

- Norris, C.H. and Wilber, J. B. and Utku, S. "Elementary Structural Analysis" Mc Graw Hill, Tokyo, Japan.
- Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA. 3. Kazmi, S. M. A., 'Solid Mechanics" TMH, Delhi, India.
- Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004

SOLID MECHANICS

Course Code: CIV 405

Credit Units: 02
Total Hours: 20

Course Objectives:
To student will understand simples stresses and strains, compound stresses and strains, bending moments and shear strains, flexural stresses etc.

Course Contents:

Module I: Simple Stresses and Strains: (4 Hours)
Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law-stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain Energy – Resilience-Gradual, sudden, impact and shock loadings – simple applications.

Module II: Compound Stresses and Strains: (3 Hours)
Two-dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two-dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants.

Module III: Bending moment and Shear Force Diagrams: (4 Hours)
Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

Module IV: Flexural Stresses-Theory of simple bending: (3 Hours)
Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Module V: Shear Stresses- Derivation of formula: (3 Hours)
Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections. Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

Module VI: Torsion: (3 Hours)
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. Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

Course Outcomes:

Students will understand the following.

- Simple Stresses and Strains
- Compound Stresses and Strains
- Bending moment and Shear Force Diagrams
- They will develop skills to problem solving in solid mechanics.

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; 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

STRUCTURAL ENGINEERING

Course Code: CIV 503

Credit Units: 03
Total Hours: 30

Course Objectives:

This course aims at providing students with a solid background on principles of structural engineering design.

Course Content:

Module I: Introduction Concepts of Energy Principles: (6 Hours)
Introduction- concepts of energy principles, safety, sustainable development in performance; what makes a structure; principles of stability, equilibrium; what is a structural engineer, role of engineer, architect, user, builder; what are the functions' what do the engineers design, first principles of process of design

Module II: Different Types of Loads on Structures: (6 Hours)
Planning and Design Process; Materials, Loads, and Design Safety; Behaviour and Properties of Concrete and Steel; Wind and Earthquake Loads.

Module III: Structural Design Criteria: (6 Hours)
Materials and Structural Design Criteria: Introduction to the analysis and design of structural systems. Analyses of determinate and indeterminate trusses, beams, and frames, and design philosophies for structural engineering. Laboratory experiments dealing with the analysis of determinate and indeterminate structures.

Module IV: Different Types of Structural Elements: (6 Hours)
Design of Structural Elements; Concrete Elements, Steel Elements, Structural Joints; Theories and concepts of both concrete and steel design and analysis both at the element and system levels. Approximate Analysis Methods as a Basis for Design; Design of AICTE Model Curriculum for Undergraduate degree in Civil Engineering (Engineering & Technology) 135 | Page Reinforced Concrete Beams for Flexure; Design of Reinforced Concrete Beams for Shear; Bond, Anchorage, and Serviceability; Reinforced Concrete Columns; Reinforced Concrete Slabs; Introduction to Steel Design; Tension Members and Connections; Bending Members; Structural Systems.

Module V: Prestress Concrete Design: (6 Hours)
System Design Concepts; Special Topics that may be Covered as Part of the Design Project Discussions; Cable Structures; Prestressed Concrete Bridges; Constructability and Structural Control; Fire Protection.

Course Outcome:

- The students will be able to apply their knowledge of structural mechanics in addressing design problems of structural engineering.

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; Att: Attendance

Text & References:

- Nilson, A. H. Design of Concrete Structures. 13th edition. McGraw Hill, 2004
- McCormac, J.C., Nelson, J.K. Jr., Structural Steel Design. 3rd edition. Prentice Hall, N.J., 2003.
- Galambos, T.V., Lin, F.J., Johnston, B.G., Basic Steel Design with LRFD, Prentice Hall, 1996
- Segui, W. T., LRFD Steel Design, 2nd Ed., PWS Publishing, Boston.
- Salmon, C.G. and Johnson, J.E., Steel Structures: Design and Behavior, 3rd Edition, Harper & Row, Publishers, New York, 1990.
- MacGregor, J. G., Reinforced Concrete: Mechanics and Design, 3rd Edition, Prentice Hall, New Jersey, 1997.

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

Date: 05/03/2020

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 Engineering, Amity School of Engineering & Technology, Amity University Madhya Pradesh was held on March 05, 2020 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) Mr. Pankaj Mittal, General Manager, Surya Roshni Ltd, Gwalior, External Member
ii) Dr. Raghavendra Sharma, Professor & Head ECE, Member
iii) Dr. Vivek Singh Kushwah, Associate Professor, ECE, Member
iv) Mrs. Rinkoo Bhatia, Assistant Professor, ECE, Member

2. **The agenda of the meeting included the following:**
   (a) Curriculum of First year BTech ECE Program for 2020-24 batch.
   (b) Introducing Uniform Course codes for Pre-Ph.D. course work subjects and changing their credit structure.
   (c) Discussion on trends and technologies in ECE and consideration of its inclusion in syllabus.
   (d) Any other point with due permission of the Chairperson.

3. **Discussions/Comments:**
   a. (i) Discussion: The Scheme and syllabus of the subjects to be offered by ECE Department to B. Tech. ECE for batch 2020 -2024 was presented before the members of the Board of studies. The Scheme and syllabus of all the subjects was reviewed.
   (ii) Comments: The existing scheme and syllabus is well aligned, and few changes were recommended in few subjects.

b. (i) Discussion: The syllabus of Programme B.Tech in ECE for batches 2017-2021, 2018-2022, 2019-2023 and along with the syllabus of the subjects offered by ECE to other departments was presented to BOS members and reviewed.

(ii) Comments: The syllabus of the mentioned batches and the subjects offered by ECE to other departments is well aligned. No change is recommended for the batches 2017-2021, 2018-2022, 2019-2023 but few changes are recommended in few subjects offered by ECE to other department for 2020-24 batch.

c. (i) Discussion: The syllabus of M. Tech, CBCS and Pre-PhD course work subjects was presented to BOS members and reviewed.

(ii) Comments: The Syllabus of M. Tech., CBCS course work subjects is well aligned and needs no change. Uniform course coding is adopted for Pre-PhD course work subjects and credit structure has been reviewed.

4. Recommendations:

B. Tech Program

a. The Scheme and syllabus of the subjects to be offered by ECE Department to B. Tech. ECE for batch 2020 -2024 was presented before the members of the Board of studies. The BOS members approved the ECE curriculum and syllabus. (Refer Annexure-1)

b. The modified syllabus of the subject ECE 407 (offered to Civil Engineering) was presented before the members of the Board of studies. The BOS members approved the syllabus. (Refer Annexure-2)

c. The modified syllabus of the subject ECE 401 was presented before the members of the Board of studies. The BOS members approved the syllabus. (Refer Annexure-3)

d. The subject ECE 101 (Basic Electrical Engineering) and ECE 121 (Basic Electrical Engineering Lab) will be included in B Tech II semester of all branches (ECE, CSE, ME, CE and Bio-Tech). The BOS members approved the changes.

e. The subject ECE 306 (Digital Electronics & Logic Design) and ECE 326 (Digital Electronics & Logic Design Lab) is deleted form BCA I Semester and New Subjects ECE 106 (Digital Electronics) and ECE 126 (Digital Electronics Lab) is added. The BOS members approved the changes. (Ref Annexure-4)

M. Tech Program:

There is no change in the scheme and syllabus of the course. (Ref Annexure-5)

Pre Ph.D. Course:

There is a change in the scheme and syllabus of the courses. (Ref Annexure -6)

PhDEE 103: Advance Microwave Engineering - (Credits: 03)

PhDEE 105: Satellite Communication - (Credits: 03)

PhDEE 106: Advance Information Theory and Coding - (Credits: 03)

PhDEE 107: Computer Communication and Networks - (Credits: 03)

PhDEE 108: Antenna Theory and Design - (Credits: 03)

PhDEE 109: Low Power VLSI Design - (Credits: 03)

CBCS:

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

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			
Sr. No	**Program**	**Course Title**	**Old Course Code**	**No. of Credits**	**Addition/ deletion in the Syllabus**	**New Course Title**	**New Course Code**	**No. of Credits**
1	PhD	Advance Microwave Engineering	PhDEE 103	3	No Change	No Change	PEC 101	4
2	PhD	Satellite Communication	PhDEE 105	3			PEC 102	4
3	PhD	Advance Information Theory and Coding	PhDEE 106	3			PEC 103	4
4	PhD	Computer Communication and Networks	PhDEE 107	3			PEC 104	4
5	PhD	Antenna Theory and Design	PhDEE 108	3			PEC 105	4
6	PhD	Low Power VLSI Design	PhDEE 109	3			PEC 106	4
7	B Tech (ME & Civil)	Basic Electrical Engineering	ECE 101	3	Shifted from Sem I to II	No Change	No Change	3
8	B Tech (ME & Civil)	Basic Electrical Engineering Lab	ECE 121	1	Shifted from Sem I to II	No Change	No Change	1
9	BCA	Digital Electronics & Logic Design	ECE 306	3	Subject deleted from Sem I	-	-	-
10	BCA	Digital Electronics & Logic Design Lab	ECE 326	1	Subject deleted from Sem I	-	-	-
11	BCA	-	-	-	New subject added in Semester I	Digital Electronics	ECE 106	3
12	BCA	-	-	-	New subject added in Semester I	Digital Electronics Lab	ECE 126	1

13	B Tech (ECE)	MATLAB and SIMULINK Lab	ECE 325	2	Shifted from Sem III to IV	No Change	No Change	1
14	B Tech (ECE)	Electronics Workshop Lab	ECE 425	2	No Change	No Change	ECE 425	1
15	B Tech (ECE)	Probability Theory and Stochastic Processes	ECE 602	3	Subject deleted	-	-	-
16	B Tech (ECE)	Speech and Audio Processing	ECE 807	3	Elective shifted from Sem VIII to VI with changed code	No Change	ECE 607	3
17	B Tech (ECE)	Speech and Audio Processing Lab	ECE 827	1	Elective shifted from Sem VIII to VI with changed code	No Change	ECE 627	1
18	B Tech (ECE)	Analog and Digital Communication	ECE 401	3	Few modules are revised, and syllabus is aligned	No Change	No Change	3
19	B Tech (ECE)	Instrumentation & Sensor Technologies for Civil Engineering Applications	ECE 407	2	Few modules are revised as syllabus is aligned as per CIVIL requirements	No Change	No Change	2

BOARD OF STUDIES (ECE)
MINUTES OF THE MEETING

Signature of Members:

Dr Vivek Singh Kushwah
Member

Mrs Rinkoo Bhatia
Member

Dr Raghavendra Sharma
Member

Maj Gen (Dr) S C Jain
Chairman- BOS

Mr. Pankaj Mittal
External Member

Prof (Dr) R S Tomar
Dean (Academics)
AUMP, Gwalior

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

APPROVED BY

Hon'ble Vice Chancellor
AUMP, Gwalior

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

Date: 06/03/2020

BOARD OF STUDIES (Mechanical Engineering)
MINUTES OF THE MEETING
(05 Pages Only)

1. A meeting of board of studies of Department of Mechanical Engineering, Amity School of Engineering & Technology, Amity University Madhya Pradesh was held on 06/03/2020 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. Chaitanya Sharma, Associate Professor and Head ME, RJIT, Tekanpur, External Member

   ii) Dr. CP Jawahar, Professor & Head ME, Member

   iii) Mr. Nasir Khan, Asst. Prof. ME, Member

   iv) Dr. Sandeep Rathee, Assistant Professor, ME, Member

2. **The agenda of the meeting included the following:**

   (a) Curriculum of First year B.Tech ME Program for 2020-24 batch.

   (b) Introducing Uniform Course codes for Pre-Ph.D course work subjects and changing their credits structure.

   (c) Discussion on trends and technologies in ME and consideration of its inclusion in syllabus.

   (d) Any other point with due permission of the Chairperson.

3. **Discussions/Comments:**

   a. (i) Discussion: The Scheme and syllabus of the subjects to be offered by ME Department to B. Tech. ME for batch 2020 -2024 was presented before the members of the Board of studies. The Scheme and syllabus of all the subjects was reviewed.

(ii) Comments: The existing scheme and syllabus is well aligned, and few changes were recommended in few subjects.

b. (i) Discussion: The syllabus of Programme B.Tech in ME for batches 2017-2021, 2018-2022, 2019-2023 and along with the syllabus of the subjects offered by ME to other departments was presented to BOS members and reviewed.

(ii) Comments: The syllabus of the mentioned batches and the subjects offered by ME to other departments is well aligned and needs no change.

c. (i) Discussion: The syllabus of M. Tech, CBCS and Pre-PhD course work subjects was presented to BOS members and reviewed.

(ii) Comments: The Syllabus of M. Tech., CBCS course work subjects is well aligned and needs no change. Uniform course coding is adopted for Pre-PhD course work subjects and credit structure has been reviewed.

4. Recommendations:

B. Tech Program

The Scheme and syllabus of the subjects to be offered by ME Department to B. Tech.ME for batch 2020 -2024 was presented before the members of the Board of studies. The BOS members approved the ME curriculum and syllabus.

M. Tech Program:

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

Pre Ph.D. Course:

There is a change in the scheme and syllabus of the courses. (Ref Annexure -1)

PME 104: Optimization Technique - (Credits: 04)

PME 105: Experimental Methods for Engineers - (Credits: 04)

PME 106: Advance Welding Techniques and Metallurgy - (Credits: 04)

PME 107: Product Design & Development - (Credits: 04)

CBCS:

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

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			
Sr. No	**Program**	**Course Title**	**Old Course Code**	**No. of Credits**	**Addition/ deletion in the Syllabus**	**New Course Title**	**New Course Code**	**No. of Credits**
1	PhD	Optimization Technique	PhDME 103	3	YES (subject & module addition)	No Change	PME 104	4
2	PhD	Experimental Methods for Engineers	NA	3			PME 105	4
3	PhD	Advance Welding Techniques and Metallurgy	NA	3			PME106	4
4	PhD	Product Design & Development	PhDME 104	3			PME 107	4

BOARD OF STUDIES (ME)
MINUTES OF THE MEETING

Signature of Members:

Dr Sandeep Rathee
Member

Mr. Nasir Khan
Member

Dr C P Jawahar
Member

Maj Gen (Dr) S C Jain
Chairman- BOS

Dr Chaitanya Sharma
External Member
(ABSENT)

06/3/2020

Prof (Dr) R S Tomar
Dean (Academics)
AUMP, Gwalior

06/03/2020

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

APPROVED BY

17/3/2020

Hon'ble Vice Chancellor
AUMP, Gwalior

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

MEETING OF BOARD OF STUDIES (BOS)
(Mechanical Engineering)
Amity School of Engineering & Technology
March, 2020

Remarks & Suggestions by BOS Members

MOOC Courses for the Department of Mechanical Engineering:

The following course of SWAYAM is recommended to be given as CBCS "Mechanical Engineering" in the Batch 2020-2024: -

S No.	Name of Minor Track	Semester/ CBCS Course Code/ Course Name	Name of course from SWAYAM	Duration	Credits
1	**Mechanical Engineering**	III /CBK302 Design of Machine Elements	Strength of Materials	12 Weeks	**3**

More than 70 % consistency/ similarity exist between the syllabus of course offered in the CBCS and MOOC course.

Signatures : .....

Dr. Sandeep Rathee

.....

.....

HOD, ME

MOOC Courses for the Department of Mechanical Engineering:

The following course of SWAYAM is recommended to be given as CBCS "Renewable Energy" in the Batch 2020-2024: -

S No.	Name of Minor Track	Semester/ CBCS Course Code/ Course Name	Name of course from SWAYAM	Duration	Credits
1	Renewable Energy	III /CBL302 Renewable Energy System-II	Technologies for Clean and Renewable Energy Production	12 Weeks	3

More than 70 % consistency/ similarity exist between the syllabus of course offered in the CBCS and MOOC course.

Signatures : ..... Dr. Sandeep Rathee .... HOD, ME

Amity University Madhya Pradesh

Amity School of Engineering and Technology

Department of Mechanical Engineering

Pre Ph. D. Course Scheme batch 2020-2023
Mechanical Engineering

Note:

The candidate has to opt one paper from the following for the Pre Ph. D. Course:

1. Optimization Technique (PME 104)
2. Experimental Methods for Engineers (PME 105)
3. Advance Welding Techniques for Engineers (PME 106)
4. Product Design & Development (PME 107)

OPTIMIZATION TECHNIQUE

Course Code: PME 104 **Credit Units: 04**
Total Hours: 40

Course Objective:
The objective of the course is to learn classical optimization techniques and numerical methods of optimization. Know the basics of different evolutionary algorithms. Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas.

Course Contents:

Module I: Linear Programming: (10 Hours)
Solution of LPP by simplex Method, Duality and its solution, Transportation Problem: Initial Solution, Test for Optimality, Unbalanced Transportation Problem, Degeneracy, Alternative Optimal Solutions, Prohibited Transportation, Maximization Transportation Problem Routs, Assignment Problem: Introduction, solution by Hungarian Method, Multiple Optimal Solution, Unbalanced Assignment Problem, Maximization Case in Assignment Problem, Restriction on Assignments.

Module II: Game Theory: (10 Hours)
Introduction, Two-Person Zero Sum Games, Pure Strategies: Games with Saddle Point, Mixed Strategies: Games without saddle point, Principle of Dominance, Solution Methods for games without saddle point – Algebraic Method, Arithmetic Method, Matrix Method, and Graphical Method.

Module III: Simulation and Sequencing: (10 Hours)
Process of simulation, Monte Carlo Simulation, Simulation of an Inventory system, Simulation of Queuing System, Applications of Simulation. Gantt charts, Algorithm for solving sequencing problems: Johnson's Rule, Processing n Jobs Through 2 Machines, Processing N Jobs Through 3 Machines, Processing 2 Jobs Through 'K' Machines, Maintenance Crew Scheduling

Module IV: Network Analysis and Inventory Models: (10 Hours)
Network Definition and Network Diagram, Probability in Pert Analysis, Project Time Cost Trade Off, Introduction to Resource Smoothing and Allocation.
Introduction to Inventory Control, Deterministic Inventory Model, EOQ Model with Quantity Discount. Replacement of Items, Subject to Deterioration of Items, Subject to Random Failure, Group Vs Individual Replacement Policies.

Course Outcomes:

After successful completion of the course students will have the knowledge and skill to:

- Understand importance of optimization of industrial process management
- Apply basic concepts of mathematics to formulate an optimization problem
- Analyse and appreciate variety of performance measures for various optimization 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

Text & Reference Books

- S.S. Rao, Optimization: Theory and applications, Wiley Eastern Ltd
- G.V. Reklaitis, Engg. Optimization Methods & applications
- London N.P. Linear Programming, Tata McGraw-Hill
- Sharma J.K. 1997, Operations Research: Theory & Appplicatinos, Mac Millan India Ltd.
- Grobner D.F. & Shannon P.W., Essential of Business Statistics: A Decision Making Approach, MacMillan College Publishing Co.
- Inventive thinking through TRIZ: a practical guide, By Michael A. Orloff, Springer.
- Systematic innovation: an introduction to TRIZ ; (theory of inventive Problem
- Solving), By John Terninko, AllaZusman, CRC Press.

EXPERIMENTAL METHODS FOR ENGINEERS

Course Code: PME 105 **Credit Units: 04**
Total Hours: 40

Course Objective:
To understand the measurement characteristics and working principle of various measuring devices.

Course contents:

Module I Measurement Characteristics: (08 Hours)
Introduction - Basic concepts – Calibration – Standards - Generalized measurement system - Basic concepts in dynamic measurements – zeroth, first and second order systems – Experimental errors, types and analysis.

Module II Analysis of Experimental Data: (10 Hours)
Statistical analysis of experimental data – Probability distribution – Normal error distribution – Comparison of data with normal distribution – Methods of least squares – Correlation coefficient – Multivariable regression – Graphical analysis and curve fitting – General considerations in data analysis.

Module III Pressure and Flow Measurements: (12 Hours)
Mechanical pressure measurement devices – Manometer, Bourdon type pressure gauge, Mcleod gauge. Flow measurement - Anemometers. Flow visualization methods – Shadowgraph, Interferometer, Laser Doppler Anemometer. Temperature measurements by mechanical and electrical effects – Force measurements – Mass balance and Elastic elements - Torque measurements - Strain measurements – Vibration measurements – Simple vibration instrument, seismic instrument.

Module IV Data Acquisition and Design of Experiments: (10 Hours)
General data acquisition system – Data transmission – Digital-to-analog – Analog-to-digital conversion- Data storage and display.
Design of experiments – Types - Experiment design factors – Experiment design protocol – Examples.

Course Outcomes:
At the end of the course, students will be able to

- Estimate the experimental uncertainty.
- Analyse the experimental data using various methods.
- Select the measuring devices according to the applications.

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 & Reference Books

- Holman, J.P., Experimental methods for Engineers, Tata McGraw-Hill.
- Doblin E.O, Measurement System Application and Design, Second Edition, McGraw Hill.
- Nakra, B.C., Choudhry K.K., Instrumentation, Measurements and Analysis Tata McGraw Hill.
- Morris.A.S, Principles of Measurements and Instrumentation, Prentice Hall of India.

ADVANCE WELDING TECHNIQUES AND METALLURGY

Course Code: PME 106

Credit Units: 04
Total Hours: 40

Course Objective:
The objective of this course is to introduce the scholars to the basic concepts of welding and the advanced welding techniques.

Course Contents:

Module I: Introduction to Conventional Welding: (08 Hours)
Overview of joining techniques, introduction to welding, classification of welding techniques, types of joints, edge preparation, weld symbols and weld nomenclature, heat sources, heat flux, Arc welding processes, resistance and other conventional welding processes.

Module II: Advance Welding Processes: (10 Hours)
Electron beam welding, laser beam welding, ultrasonic welding, friction welding, friction stir welding, Dissimilar metal joining, joining processes selection, applications of welding processes. Case studies and applications of advance welding techniques in industries, automotive and aerospace applications.

Module III: Testing of Welding: (12 Hours)
Microstructures of weldment, segregation of alloying elements, impact of micro/ macro-structures and segregation on mechanical properties, pre and post-treatment. Effects of heat flow on residual stresses and distortion. Weldability tests.
Methods of testing weldments - mechanical, pressure and leak testing. Inspection methods- visual, penetrant, magnetic, ultrasonic, x-ray and gamma radiography. Use of imaging techniques for online monitoring.

Module IV: Welding Metallurgy: (10 Hours)
Introduction to welding metallurgy, phase diagrams, metal strengthening approaches, heat treatment processes for weldments. Welding characteristics of ferrous and non ferrous metals. Introduction and properties of different zones in welds, effect of heat input on grain sizes of weldment, recrystallization and grain growth, effect of grain size on mechanical properties of welded joints.

Course Outcomes:

After successful completion of this course, students will have the knowledge and skills to:

- Understand the basic mechanisms of welding
- Physics of welding arc
- Solid state welding techniques
- Welding metallurgy

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 & Reference Books

- Edward R. Bohnart - Welding: Principles and Practices- Mc Graw Hill India
- Little R. L. - 'Welding and Welding Technology' - Tata McGraw Hill Publishing Company Limited.
- Grong O. - 'Metallurgical Modelling of Welding' - The Institute of Materials.
- Kou S. - 'Welding Metallurgy' - John Wiley Publications, New York.
- Sindo Kou, Welding Metallurgy, John Wiley
- S. A. David, Ed.; Advances in Welding Science and Technology, American Society for Metals, Ohio, 1986.
- K. Easterling, Introduction to Physical Metallurgy of Welding, Butterworths Publication.

PRODUCT DESIGN & DEVELOPMENT

Course Code: PME 107 **Credit Units: 04**
Total Hours: 40

Course Objective:
The focus of Product Design and Development is integration of the marketing, design, and manufacturing functions of the firm in creating a new product. The course is intended to provide you with the following benefits: Competence with a set of tools and methods for product design and development.

Course Contents:

Module I: Introduction: (10 Hours)
Significance of Product Design, Product Design and Development Process, Sequential Engineering Design Method, The Challenges of Product Development,
Product Planning and Project Selection: Identifying Opportunities Evaluate and Prioritize Projects, Allocation of Resources

Module II: Identifying Customer Needs and Concept Generation: (10 Hours)
Interpret Raw Data in Terms of Customers Need, Organize Needs in Hierarchy and Establish The Relative Importance of Needs.
Product Specifications: Establish Target Specifications, Setting Final Specifications, **Concept Generation** Activities of Concept Generation, Clarifying Problem, Search Both Internally and Externally, Explore the Output.

Module III: Industrial Design: (10 Hours)
Assessing Need for Industrial Design, Industrial Design Process, Management, Assessing Quality of Industrial Design.
Theory of inventive problem solving (TRIZ): Fundamentals, Methods and Techniques, General Theory of Innovation and TRIZ, Value Engineering Applications in Product Development and design, Model-Based Technology for Generating Innovative Ideas
Concept Testing: Elements of Testing: Qualitative And Quantitative Methods Including Survey, Measurement of Customers' Response,

Module IV: Intellectual Property and Reverse Engineering: (10 Hours)
Elements and Outline, Patenting Procedures, Claim Procedure.
Design for Environment: Impact, Regulations From Government, ISO System.
Place of Reverse Engineering in Product Development. Data Acquisition Methods, Practical Problems in Data Acquisition, Preprocessing: Registration, Segmentation, Triangulation, Definition, Surface Fitting Methods-Bezier, B-Spline & NURBS, CAD Model Creation.

Course Outcomes:

After successful completion of the course students will have the knowledge and skill to:

- Identify and analyse the product design and development processes in manufacturing industry.
- Define the components and their functions of product design and development processes and their relationships from concept to customer over whole product lifecycle.
- Analyse, evaluate and apply the methodologies for product design, development and management.
- Undertake a methodical approach to the management of product development to satisfy customer needs.
- Carry out cost and benefit analysis through various cost models.
- Be familiar with the design protection and Intellectual Property.

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 & Reference Books

- Ulrich K. T, and Eppinger S.D, Product Design and Development, Tata McGraw Hill
- Otto K, and Wood K, Product Design, Pearson
- Engineering of creativity: introduction to TRIZ methodology of inventive Problem
- Solving, By Semyon D. Savransky, CRC Press.

Bachelor of Technology
(Mechanical Engineering)

BME

AICTE MODEL CURRICULUM

(2020-24 Batch)

Bachelor of Technology
(Mechanical Engineering)

Programme Code: BME

Duration – 4 Years Full Time

Programme Structure
&
Curriculum & Scheme of Examination

2020-24
(Based on AICTE)

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 different codes used for the components of evaluation are given below:-

Components	**Codes**
Case Discussion/ Presentation/ Analysis	C
Home Assignment	H
Project	P
Seminar	S
Viva	V
Quiz	Q
Class Test	CT
Attendance	A
End Semester Examination	ESE

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.

2020

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.Professional Skills : An ability to understand the basic concepts in Mechanical Engineering and to apply them to various areas, like Automobile, power plant, Production, Manufacturing etc., in the design and implementation of complex systems.

PSO2. Problem-solving skills: An ability to solve complex Mechanical Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.

PSO3. Successful career and Entrepreneurship: An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.

PROGRAMMESTRUCTURE

FIRST SEMESTER						
Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits	Hours
MAT101	Applied Mathematics – I (Calculus and Linear Algebra)	3	1	-	4	40
CHE101	Applied Chemistry	3	1	-	4	40
CSE104	Programming for Problem Solving	3	-	-	3	30
BME101	Engineering Graphics & Design	1	-	-	1	10
CIV101	Basic Civil Engineering & Applied Mechanics	2	-	-	2	20
CHE121	Applied Chemistry Lab	-	-	2	1	20
CSE124	Programming for Problem Solving Lab	-	-	4	2	40
BME121	Engineering Graphics & Design Lab	-	-	4	2	40
BCU141	Communication Skills – I	1			1	10
EVS142	Environmental Studies – I	2	-	-	2	20
BSU143	Behavioural Science – I	1	-	-	1	10
FLU144	French -I	2	-	-	2	20
CBCS		3	-	-	3	30
TOTAL CREDITS (Including CBCS)					**28**	
Total Hours Including CBCS per week					**33**	
Total Hours in the Semester					**330**	

SECOND SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
MAT201	Applied Mathematics–II (Ordinary & Partial Differential Equations and Transform)	3	1	-	4	40
PHY101	Applied Physics – I	3	1	-	4	40
ECE101	Basic Electrical Engineering	3	-	-	3	30
CSE204	Object Oriented Programming Using C++	1	1	-	3	30
BME102	Workshop/ Manufacturing Practices	1	-	-	1	10
PHY121	Applied Physics Lab – I	-	-	2	1	20
ECE121	Basic Electrical Engineering Lab	-	-	2	1	20
CSE224	Object Oriented Programming Using C++ Lab	-	-	2	1	20
BME122	Workshop/ Manufacturing Practices Lab	-	-	4	2	40
BCU241	Communication Skills – II	1	-	-	1	10
EVS242	Environmental Studies – II	2	-	-	2	20
BSU243	Behavioural Science – II	1	-	-	1	10
FLU244	French -II	2	-	-	2	20
CBCS		3	-	-	3	30
TOTAL CREDITS (Including CBCS)					**29**	
Total Hours Including CBCS per week					**34**	
Total Hours in the Semester					**340**	
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	Hours
MAT 301	Applied Mathematics – III (Probability, Statistics and Numerical Methods)	3	-	-	3	30
PHY 303	Applied Physics – II	3	-	-	3	30
BME 301	Engineering Mechanics	3	-	-	3	30
BME 302	Material Science & Metallurgy	3	-	-	3	30
BME 303	Thermodynamics	3	-	-	3	30
ECE 307	Basic Electronics	2	-	-	2	20
PHY 323	Applied Physics Lab – II	-	-	2	1	20
BME 321	Engineering Mechanics Lab	-	-	2	1	20
BME 323	Thermodynamics lab	-	-	2	1	20
ECE 327	Basic Electronics lab	-	-	2	1	20
BCU 341	Communication Skills – III	1	-	-	1	10
BSU 343	Behavioural Science – III	1	-	-	1	10
FLU 344	French– III	2	-	-	2	20
NTP 330	**Term paper (Evaluation)**	-	-	-	2	
CBCS		3	-	-	3	30
TOTAL CREDITS (Including CBCS)					**30**	
Total Hrs Including CBCS					**32**	
Total Hrs in the Semester					**320**	

FOURTH SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
BME 401	Fluid Mechanics	3	-	-	3	30
BME 402	Heat and Mass Transfer	3	-	-	3	30
BME 403	Kinematic of Machine	3	-	-	3	30
BME 404	Manufacturing Machine	3	-	-	3	30
BME 405	Strength of Material	3	-	-	3	30
BME 422	Heat and Mass Transfer Lab	-	-	2	1	20
BME 423	Kinematic of Machine Lab	-	-	2	1	20
BME 424	Manufacturing Machine Lab	-	-	2	1	20
BME 425	Strength of Material & Fluid Mechanics Lab	-	-	2	1	20
BCU 441	Communication Skills – IV	1	-	-	1	10
BSU 443	Behavioural Science – IV	1	-	-	1	10
FLU 444	French– IV	2	-	-	2	20
CBCS		3	1	-	4	40
TOTAL CREDITS (Including CBCS)					**27**	
Total Hrs Including CBCS					**31**	
Total Hrs in the Semester					**310**	
INDUSTRIAL 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	Hours
BME 501	Applied Thermodynamics	3	-	-	3	30
BME 502	Dynamics of Machines	3	-	-	3	30
BME 503	Machine Design –I	3	-	-	3	30
BME 504	Measurement and Control	3	-	-	3	30
BME 505	Metrology	3	-	-	3	30
BME 522	Dynamics of Machine Lab	-	-	2	1	20
BME 524	Measurement and Control Lab	-	-	2	1	20
BME 525	Metrology lab	-	-	2	1	20
BCU 541	Communication Skills –V	1	-	-	1	10
BSU 543	Behavioural Science – V	1	-	-	1	10
FLU 544	French– V	2	-	-	2	20
NPT 550	**Industrial Practical Training - I (Evaluation)**	-	-	-	3	-
CBCS		3	1	-	4	40
TOTAL CREDITS (Including CBCS)						**29**
Total Hrs Including CBCS						**29**
Total Hrs in the Semester						**290**

SIXTH SEMESTER						
Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits	Hours
BME 601	Fluid Power Systems	3	-	-	3	30
BME 602	IC Engine & Gas Turbine	3	-	-	3	30
BME 603	Machine Design – II	3	-	-	3	30
BME 604	Manufacturing Technology	3	-	-	3	30
BME 621	Fluid Power Systems Lab	-	-	2	1	20
BME 622	IC Engine & Gas Turbine Lab	-	-	2	1	20
BME 623	Machine Design Lab – II	-	-	2	1	20
ELECTIVES (Anyone from following with Practical)					**4**	**50**
BME 606	Mechatronics	3	-	-		
BME 607	Artificial Intelligence and Robotics	3	-	-		
BME 626	Mechatronics Lab	-	-	2		
BME 627	Artificial Intelligence and Robotics lab	-	-	2		
BCU 641	Communication Skills – VI	1	-	-	1	10
BSU 643	Behavioural Science – VI	1	-	-	1	10
FLU 644	French– VI	2	-	-	2	20
NMP 660	**Minor Project**	-	-	-	2	-
CBCS		-	-	-	1	-
TOTAL CREDITS (Including CBCS)					**26**	
Total Hrs Per Week					**27**	
Total Hrs in the Semester					**270**	
INDUSTRIAL PRACTICAL TRAINING –II: 6 – 8 WEEKS						

SEVENTH SEMESTER						
Course Code	Course Title	Lecture (L) Hours Per week	Tutorial (T) Hours Per week	Practical (P) Hours Per week	Total Credits	Hours
BME 701	Operations Research	3	-	-	3	30
BME 702	Computer Aided Manufacturing	3	-	-	3	30
BME 703	Management of Manufacturing Systems	3	-	-	3	30
BME 721	Operations Research (Programming) Lab	-	-	2	1	20
BME 722	Computer Aided Manufacturing Lab	-	-	2	1	20
ELECTIVES (Any one from each category)					**4**	**50**
A (With Practical)						
BME 704	Automotive Engineering	3	-	-		
BME 705	Computer Aided Designing	3	-	-		
BME 724	Automotive Engineering Lab	-	-	2		
BME 725	Computer Aided Designing Lab	-	-	2		
ELECTIVES (Any one from each category)					**3**	**30**
B (Without Practical)						
BME 706	Marketing Management	3	-	-		
BME 707	Solar Energy	3	-	-		
BME 708	Power Plant Practices	3	-	-		
BME 709	Combustion Engine Emissions	3	-	-		
BCU 741	Communication Skills – VII	1	-	-	1	10
BSU 743	Behavioural Science – VII	1	-	-	1	10
FLU 744	French– VII	2	-	-	2	20
NPT 750	**Industrial Practical Training– II(Evaluation)**	-	-	-	5	
NMP 760	**Major Project – I**	-	-	-	6	
TOTAL CREDITS					**33**	
Total Hrs Per Week					**25**	
Total Hrs in the Semester					**250**	

EIGHT SEMESTER						
Course Code	**Course Title**	**Lecture (L) Hours Per week**	**Tutorial (T) Hours Per week**	**Practical (P) Hours Per week**	**Total Credits**	**Hours**
BME 801	Quality Control & Quality Assurance	3	-	-	3	30
BME 802	Refrigeration & Air-conditioning	3	-	-	3	30
BME 822	Refrigeration & Air-conditioning Lab	-	-	2	1	20
ELECTIVES (Any one from following with Practical)					**4**	**50**
BME 803	Advanced Methods of Manufacturing	3	-	-		
BME 804	Gear Technology	3	-	-		
BME 823	Advanced Methods of Manufacturing Lab	-	-	2		
BME 824	Gear Technology Lab	-	-	2		
BCU 841	Communication Skills – VIII	1	-	-	1	10
BSU 843	Behavioural Science – VIII	1	-	-	1	10
FLU 844	French– VIII	2	-	-	2	20
NMP 860	**Major Project – II**	-	-	-	9	
TOTAL CREDITS					**24**	
Total Hrs Per Week					**17**	
Total Hrs in the Semester					**170**	

Bachelor of Technology
(Mechanical Engineering)

Programme Code: BME

Duration – 4 Years Full Time

OVERALL CREDIT

Sr. No.	Semester	No. of Credits	No. of Hours
1	I	28	33
2	II	29	34
3	III	30	32
4	IV	27	31
5	V	29	29
6	VI	26	27
7	VII	33	25
8	VIII	24	17
Total Credits		**226**	**228**