



ALIAH UNIVERSITY
Curriculum for B. Tech in Civil Engineering Department

Course Structure and Syllabus

for

4 Year B. Tech Programme

In Civil Engineering

w. e. f 2018-19

Department of Civil Engineering

Aliah University

II A/ 27, Newtown, Kolkata 700156,

West Bengal, India

Jafar Salam
08/03/19

A. S.
8.3.19

Sunil
08/03/19

A. S.
08/03/19

A. Kram
8.3.2019

A. S.
8/3/19

S. K.
08/03/2019
Mohsin Javed
8/3/19

M. A. S.
8/3/19
M. A. S.

A. S.
08/03/19



ALIAH UNIVERSITY

Curriculum for B. Tech in Civil Engineering Department

1st YEAR 1st SEMESTER

Sl no	Category Index	Paper code	Name of the paper	Periods per week				Credit
				L	T	P	T	
1	ESC	ME 101	Engineering Mechanics	3	1	0	4	4
2	ESC	EE 101	Basic Electrical Engineering	3	0	0	3	3
3	BSC	MA 133	Engineering Mathematics I	4	0	0	4	4
4	BSC	PH 151	Engineering Physics	3	0	0	3	3
5	ESC	CE 191	Engineering Graphics & Design	1	0	3	4	2.5
6	ESC	EE 191	Basic Electrical Engineering Lab	0	0	3	3	1.5
7	BSC	PH 161	Engineering Physics Lab	0	0	3	3	1.5
8	MC	AI 131	Elementary Arabic & Islamic Studies	4	0	0	4	0
TOTAL PERIOD PER WEEK								28
TOTAL CREDIT								19.5

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Curriculum for B. Tech in Civil Engineering Department

1st YEAR 2nd SEMESTER

Sl no	Category Index	Paper code	Name of the paper	Periods per week				Credit
				L	T	P	T	
1	ESC	CSE 102	Programming for Problem Solving	3	0	0	3	3
2	ESC	ECE 102	Basic Electronics Engineering	3	0	0	3	3
3	BSC	MA 134	Engineering Mathematics II	4	0	0	4	4
4	BSC	CH 152	Engineering Chemistry	3	0	0	3	3
5	HSMC	EN 132	Communicative English	3	0	0	3	3
6	ESC	CSE 192	Programming for Problem Solving Lab	0	0	4	4	2
7	ESC	ECE 192	Basic Electronics Engineering Lab	0	0	3	3	1.5
8	ESC	ME 192	Workshop Practice	0	1	2	3	2
9	BSC	CH 162	Engineering Chemistry Lab	0	0	3	3	1.5
10	HSMC	EN 192	Language Lab	0	0	2	2	1
TOTAL PERIOD PER WEEK								31
TOTAL CREDIT								24

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Mohsin Jamil
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ALIAH UNIVERSITY

Curriculum for B. Tech in Civil Engineering Department

2nd YEAR 3rd SEMESTER

Sl no	Category Index	Paper code	Name of the paper	Periods per week				Credit
				L	T	P	T	
1	HMC	CE207	(Introduction to Civil Engineering Or, Civil Engineering-Societal & Global Impact)	2	0	0	2	2
2	PCC	CE 201	Mechanics of Materials	2	1	0	3	3
3	PCC	CE 203	Surveying & Geomatics	2	1	0	3	3
4	PCC	CE 205	Building materials	3	0	0	3	3
5	MC	MC 231	Indian Constitution	2	0	0	2	0
6	BSC	MA 233	Engineering Mathematics III	4	0	0	4	4
7	PCC	CE281	Estimation, Costing & Valuation	1	0	3	4	2.5
8	PCC	CE 291	Civil Engineering Drawing Lab.	0	0	3	3	1.5
TOTAL PERIOD PER WEEK								23
TOTAL CREDIT								19

Jufar Sedar A
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Mohsin Farid
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Abu
8/3/19

Sumit
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Maha
08/03/19

Abu
08/03/19



ALIAH UNIVERSITY

Curriculum for B. Tech in Civil Engineering Department

3rd YEAR 5th SEMESTER

Sl no	Category Index	Paper code	Name of the paper	Periods per week				Credit
				L	T	P	T	
1	PCC	CE 301	Design of Steel Structures	2	1	0	3	3
2	PCC	CE 303	Open Channel Flow	2	1	0	3	3
3	PCC	CE 305	Soil Mechanics	2	1	0	3	3
4	PCC	CE 307	Transportation Engg	2	1	0	3	3
5	OEC	---	Open Elective-I	3	0	0	3	3
6	PCC	CE381	RCC Design Sessional	0	0	3	3	1.5
7	PCC	CE391	Hydraulics & Hydraulics M/c Lab.	0	0	3	3	1.5
TOTAL PERIOD PER WEEK								21
TOTAL CREDIT								18

Jyoti Sarkar
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Mehsin Sami
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ALIAH UNIVERSITY

Curriculum for B. Tech in Civil Engineering Department

2nd YEAR 4TH SEMESTER

Sl no	Category Index	Paper code	Name of the paper	Periods per week				Credit
				L	T	P	T	
1	BSC	BIO 252	Biology for Engineers	2	0	0	2	2
2	MC	ES232	Environmental Science	2	0	0	2	0
3	PCC	CE 202	Fluid Mechanics & Hydraulics	3	1	0	4	4
4	PCC	CE 204	Structural Analysis	3	1	0	4	4
5	PCC	CE 206	Design of RCC Structures	2	1	0	3	3
6	PCC	CE208	Engineering Geology	2	0	1	3	2.5
7	PCC	CE292	Concrete Lab.	0	0	3	3	1.5
8	PCC	CE 294	Surveying Lab.	0	0	3	3	1.5
TOTAL PERIOD PER WEEK								24
TOTAL CREDIT								18.5

Jaffer Sedhan A.
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Mohsin Farid
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Curriculum for B. Tech in Civil Engineering Department

4th YEAR 7th SEMESTER

Sl no	Category Index	Paper code	Name of the paper	Periods per week				Credit
				L	T	P	T	
1	PEC	CE401	PEC-III ()	3	0	0	3	3
2	PEC	CE 403	PEC -IV ()	3	0	0	3	3
3	OEC		Open Elective - III (Metro Systems & Engineering)	3	0	0	3	3
4	HSMC	MS 431	Industrial Economics & Management	4	0	0	4	4
5	PROJ	CE 471	Project I	0	0	8	8	4
6	PROJ	CE 481	Summer Internship	-	-	-	-	2
7	PCC	CE491	Environmental Engineering Lab	0	0	3	3	1.5
TOTAL PERIOD PER WEEK								24
TOTAL CREDIT								20.5

Jafer Sadaq Ali
08/03/19

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Mohsin Farid
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W. Prem
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Curriculum for B. Tech in Civil Engineering Department

4th YEAR 8th SEMESTER

Sl no	Category Index	Paper code	Name of the paper	Periods per week				Credit
				L	T	P	T	
1	PCC	CE 402	Construction Management	3	0	0	3	3
2	PEC	CE 404	PEC-V (Construction Management)	3	0	0	3	3
3	PEC	CE406	PEC-VI (Civil Engineering)	3	0	0	3	3
4	HSMC	MS432	Professional Values and Ethics	2	0	0	2	2
5	PROJ	CE 472	Project II	0	0	16	16	8
6	PROJ	CE474	Grand Viva	-	-	-	-	2
TOTAL PERIOD PER WEEK								27
TOTAL CREDIT								21

Jafar Sadek
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Mehsin Farid
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W. Kram
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Curriculum for B. Tech in Civil Engineering Department

Summary of Credits

1 st Semester	2 nd Semester	3 rd Semester	4 th Semester	5 th Semester	6 th Semester	7 th Semester	8 th Semester	Total
19.5	24	19	18.5	18	19.5	20.5	21	160

Semester wise Credit Segregation

Semester	HSMC	BSC	ESC	PCC	PEC	OEC	PROJ	MC	TOTAL
1 st	-	8.5	11	-	-	-	-	√	19.5
2 nd	4	8.5	11.5	-	-	-	-	x	24
3 rd	2	4	-	12.0	-	-	-	√	19
4 th	-	2	-	17.5	-	-	-	√	18.5
5 th	-	-	-	15	-	3	-	x	18
6 th	-	-	-	10.5	6	3	-	x	19.5
7 th	4	-	-	1.5	6	3	6	x	20.5
8 th	2	-	-	3	6	-	10	x	21
TOTAL	12	23	22.5	59.5	18	9	16	0	160

Category Index	Category name
HSMC	Humanities and social science including management
BSC	Basic Science course
ESC	Engineering Science course
PCC	Professional core courses
PEC	Professional elective courses
OEC	Open elective course
PROJ	Project, seminar, internship in industry
MC	Mandatory courses

Jafar Sabir
08/03/19

08/03/2019

W. K. Sam
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Mohsin Javed
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Category Index	Category name
HSMC	Humanities and social science including management
BSC	Basic Science course
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PROJ	Project, seminar, internship in industry
MC	Mandatory courses

PEC I - Transportation Engineering

1. Pavement Materials
2. Pavement Design
3. Public Transportation Systems
4. Traffic Engineering and Management
5. Urban Transportation Planning
6. Geometric Design of Highways
7. Airport Planning and Design
8. Railway Engineering
9. Intelligent Transportation Systems
10. Highway Construction and Management
11. Port and Harbour Engineering
12. High Speed Rail Engineering
13. Transportation Economics
14. Infrastructure Planning and Design

PEC II - Engineering Hydrology

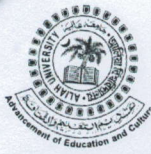
1. Surface Hydrology
2. Water Resources Field Methods
3. Urban Hydrology and Hydraulics
4. Groundwater

PEC III - Environmental Engineering

1. Ecological Engineering
2. Environmental Systems
3. Transport of Water and Wastewater
4. Environmental Laws and Policy
5. Physico-Chemical Processes for Water and Wastewater Treatment
6. Biological Processes for Contaminant Removal
7. Rural Water Supply and Onsite Sanitation Systems
8. Water and Air Quality Modelling

M. H. H. N. N.
Sh. S. S.
Akram

Jafar Sadaq A.
Mohsin P.



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Curriculum for B. Tech in Civil Engineering Department

9. Solid and Hazardous Waste Management
10. Air and Noise Pollution and Control
11. Environmental Impact Assessment and Life Cycle Analyses
12. Water Quality Engineering
13. Environmental Fluid Mechanics

PEC IV / Hydraulics Engineering

1. Design of hydraulic structures/Irrigation Engineering
2. Pipeline Engineering
3. River Engineering
4. Hydraulic modelling
5. Basics of computational hydraulics
6. Transients in closed conduits

PEC V - Structural Engineering

1. Reliability Analysis of Structures
2. Engineering Risk & Uncertainty
3. Decision and Risk Analysis
4. Engineering Materials for Sustainability
5. Advanced Structural Analysis (FEM)
6. Advanced Structural Mechanics
7. Advanced Concrete Technology
8. Advanced Design of Concrete Structures
9. Prestressed Concrete
10. Advanced Design of Steel Structures
11. Bridge Engineering
12. Industrial Structures
13. Structural Dynamics
14. Earthquake Engineering
15. Modelling and Analysis of Uncertainty
16. Structural Health Monitoring
17. Repairs & Rehabilitation of Structures
18. Metal Structure Behavior
19. Masonry Structures
20. Industrial Structures

PEC VI - Geotechnical Engineering

1. Advanced Soil Mechanics
2. Advanced Foundation Engineering
3. Geotechnical Design

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Handwritten signature: Akhla

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Handwritten signature: John Sadan et al.
Mukhtar

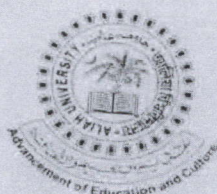


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4. Structural Geology
5. Offshore Engineering
6. Rock Mechanics
7. Environmental Geo-technology
8. Ground Improvement Techniques

Handwritten signatures and initials:
- *abd. d.*
- *Senid*
- *Jafar Sudoh A.*
- *Aliah*
- *Alamin*
- *Mohsin bin*



Aliah University

(A UGC approved autonomous Institution under the Department of Minority affairs and Madrasah Education, Govt. of West Bengal)
IIA/27, New Town (Near Eco Space), Kolkata-700156, West Bengal, India

Minutes of meeting on 19/06/2019 & 24/06/2019

Preface of the meeting:

The convener of the committee for revision of common engineering curriculum (UG & PG) as per AICTE guidelines vide memo no AU/REG/0104/18 dated Feb 2, 2018, Mr. Md Aftab Alam called two successive meetings on June 19 and June 24, 2019 respectively at 2 pm in the head (off) room of Electrical Engineering department of Aliah University. The objective of the meeting is to allocation of different open elective courses for UG curriculum of all engineering branches.

Members present:

Sl no	Name	Present on
1	Mr. Md. Raghieb Adil, Assistant Professor of CEN dept.	19/6/19, 24/6/19
2	Mr. Mohsin Jamal, Head (off) and Assistant Professor of CEN dept	24/6/19
3	Mr. Md. Wasim Akram, Assistant Professor of CEN dept.	19/6/19
4	Dr. Abhishek Das, Head and Associate Professor, CSE dept.	19/6/19, 24/6/19
5	Mr. Sk. Mosaddek Hossain, Assistant Professor of CSE dept	19/6/19, 24/6/19
6	Dr. Rimi Paul, Head (off) and Assistant Professor of EEN dept	19/6/19, 24/6/19
7	Mr. Biswapriya Chatterjee, Assistant Professor of EEN dept	19/6/19, 24/6/19
8	Mr. Md Aftab Alam, Assistant Professor of EEN dept.	19/6/19, 24/6/19
9	Dr. SK. Moinul Haque, Head and Associate Professor of ECE dept.	19/6/19, 24/6/19
10	Mr. A. H. M. Toufique Ahmed, Assistant Professor of ECE dept.	19/6/19, 24/6/19
11	Dr. Shamim Haidar, Head (off) and Assistant Professor of MEN dept	19/6/19, 24/6/19
12	Mr. Subha Mondal, Assistant Professor of MEN dept	19/6/19, 24/6/19
13	Mr. Md. Kamaruzzaman, Assistant Professor (C) of MEN dept	24/6/19
14	Mrs. Nasreen Nasar, Assistant Professor of MBA dept	24/6/19
15	Dr. Md Abdul Khan, Assistant Professor of Physics dept	19/6/19, 24/6/19
16	Mr. Akhtaruzzaman, ACoE of Aliah University	24/6/19

Issues discussed on 19/06/2019

1. To adopt uniform coding scheme of Aliah University in order to implement CBCS, the following code- "ABC-XYpq" has been proposed, where 'ABC' stands for offering department, 'XY' stands for the category of subjects and 'pq' stands for course number, eg. pq- 01, 02, 03,

2. To adopt the uniform 'XY' for all engineering departments, the following proposal has been made and well accepted by all the members. *It is worth mentioning here that this scheme is adopted as per AICTE guideline, 2018.*

Category Index	Category	New proposed 'XY'
HSMC	Humanities and social science including management	HU
BSC	Basic Science course	BS
ESC	Engineering Science course	ES
PCC	Professional core courses	PC
PEC	Professional elective courses	PE
OCC	Open elective course	OE
PROJ	Project, seminar, internship in industry	PR
MC	Mandatory courses	As per Aliah University rule

3. The new code for all common courses is appended below:

1st year 1st semester

Sl no	Code	Course	Lesson plan per week (L-T-P)	Credit
1	MENUGES01	Engineering Mechanics	3-1-0	4
2	EENUGES01/ ECEUGES01	Basic Electrical Engineering/ Basic Electronics Engineering	3-0-0	3
3	MATUGBS01	Engineering Mathematics I	4-0-0	4
4	PHYUGBS01	Engineering Physics	3-0-0	3
5	UCCUGAU01	Elementary Arabic & Islamic Studies	4-0-0	0
6	CENUGES01	Engineering Graphics & Design	0-1-3	2.5
7	EENUGES02/ ECEUGES02	Basic Electrical Engineering Lab/ Basic Electronics Engineering Lab	0-0-3	1.5
8	PHYUGBS02	Engineering Physics Lab	0-0-3	1.5
TOTAL				19.5

1st year 2nd semester

Sl no	Code	Course	Lesson plan per week (L-T-P)	Credit
1	CSEUGES01	Programming for Problem Solving	3-1-0	4
2	ECEUGES01/ EENUGES01	Basic Electronics Engineering/ Basic Electrical Engineering	3-0-0	3
3	MATUGBS02	Engineering Mathematics II	4-0-0	4
4	CHMUGBS01	Engineering Chemistry	3-0-0	3
5	ENGUGHU01	Communicative English	3-0-0	3
6	CSEUGES02	Programming for Problem Solving Lab	0-0-4	2
7	ECEUGES02/ EEN-ES02	Basic Electronics Engineering Lab/ Basic Electrical Engineering Lab	0-0-3	1.5
8	MENUGES02	Workshop Practice	0-1-2	2
9	CHMUGBS02	Engineering Chemistry Lab	0-0-3	1.5
10	ENGUGHU02	Language Lab	0-0-2	1
TOTAL				24

Other Semesters

Sl no	Code	Course	Lesson plan per week (L-T-P)	Credit
1	MATUGBS03	Engineering Mathematics III	4-0-0	4
2	BIOUGBS01	Biology for Engineers	2-0-0	2
3	MBAUGHU01	Industrial Economics & Management	4-0-0	4
4	MBAUGHU02	Professional Values & Ethics	3-0-0	3

Issues discussed on 24/06/2019

1. The five engineering as well as MBA department of Aliah University submitted the list of their open elective courses which are tabulated below:

Sem	Code		Course	Offering department
	Existing code as per resolution taken on 20.02.19	Proposed code as per new coding scheme		
3rd	OCE 201	CENUGOE01	Building Materials	CEN
	OCS 201	CSEUGOE01	Data Structures & Algorithms Analysis	CSE
	OEE 201	EENUGOE01	Circuit Theory & Networks	EEN
	OEC 201	ECEUGOE01	Electronic Devices & Circuits	ECE
	OME 201	MENUGOE01	Materials Engineering	MEN
4th	OCE 202	CENUGOE02	Engineering Geology	CEN
	OCS 202	CSEUGOE02	Computer Organization	CSE
	OEE 202	EENUGOE02	Electrical Measurement	EEN
	OEC 202/ OEC 204	ECEUGOE02/ ECEUGOE03	Principal of Communication System/ Digital Eleectronics	ECE
	OME 202	MENUGOE02	Thermodynamics	MEN
5th	OCE 301	CENUGOE03	Transportation Engineering	CEN
	OCS 301	CSEUGOE03	Object Oriented Programming	CSE
	OEE 301	EENUGOE03	Introduction to Electrical Machines	EEN
	OEC 301	ECEUGOE04	Microprocessor & its Application	ECE
	OME 301	MENUGOE03	Strength of Material	MEN
6th	OCE 302	CENUGOE04	Environmental Engineering	CEN
	OCS 302	CSEUGOE04	Data Communication & Computer	CSE
	OEE 302	EENUGOE04	Control System	EEN
	OEC 302	ECEUGOE05	Microelectronics	ECE
	OME 302	MENUGOE04	Mechatronics	MEN
7th	OCE 401	CENUGOE05	Hydraulics Engineering	CEN
	OCS 401	CSEUGOE05	Digital Image Processing	CSE
	OEE 401	EENUGOE05	Generation Transmission Distribution of Electric Power	EEN
	OEC 401	ECEUGOE06	Radar System	ECE
	OME 401	MENUGOE05	Non-conventional Energy Utilization	MEN
8th	OCE 402	CENUGOE06	Construction Management	CEN

	OCS 402	CSEUGOE06	Data Science	CSE
	OEE 402	EENUGOE06	Renewable Energy Resources	EEN
	OEC 402/ OEC 404	ECEUGOE07/ ECEUGOE08	Laser Technology/ Neural Network	ECE
	OME 402	MENUGOE06	Finite Element Method	MEN
5 th sem onwards	*	MBAUGOE01	Entrepreneurship Development	MBA

***As per present coding scheme for OECs, discussed in the meeting held on Feb 20, 2019, the codes for subjects offered by MBA department of Aliah University, has not been discussed.**

2. The departments put forward their choices of OEC for 2nd year students of 2018-19 batch. The list is tabulated below:

Department	Semester	Code	Course
CEN	3rd	X	X
	4th		
CSE	3rd	OEE 201	Circuit Theory & Networks
		**	Numerical Methods
	4th	OEC 202	Principal of Communication System
EEN	3rd	OCS 201	Data Structures & Algorithms Analysis
	4th	OME 202	Thermodynamics
ECE	3rd	OCS 201	Data Structures & Algorithms Analysis
	4th	OCS 202	Computer Organization
MEN	3rd	OCE 201	Building Materials
	4th	OEE 202	Electrical Measurement

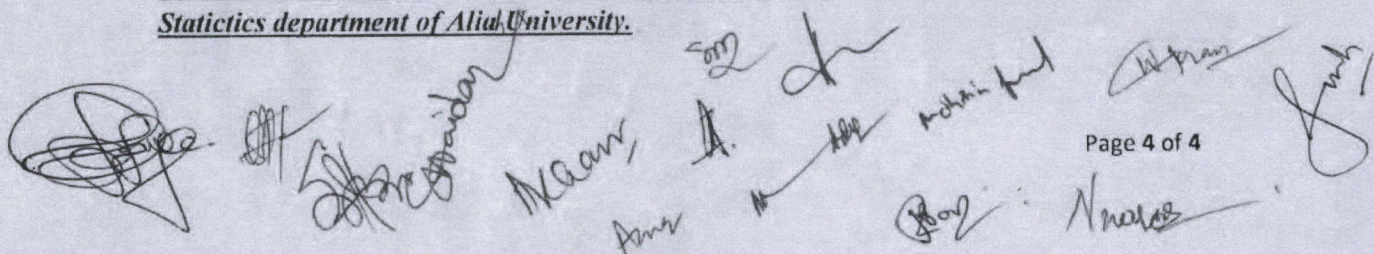
**** The code for the said course will be fixed by CSE department, as this course may not be offered by CSE department.**

3. The codes of mandatory courses for all engineering streams have been proposed as follows:

Sl no	Course	Code	Semester
1	Elementary Arabic & Islamic Studies	UCCUGAU01	1 st
2	Environmental Science	UCCUGAU02	4 th
3	Indian Constitution	UCCUGAU03	3 rd

4. Computer Science Engineering and Civil Engineering department has informed their limitation of not to offer 6 OEC in six different semester as per their AICTE model curriculum, 2018.

N. B: It is to be noted that, '-' is adopted in the new coding scheme as per issue no-1 discussed on 19/06/2019. However, '-' is replaced everywhere by 'UG' due to the fact that, it is not feasible to accommodate '-' in the new ERP system of Aliah University. This point is pointed out by Dr. Sk Monowar Hossein, Professor of Mathematics & Statistics department of Aliah University.





ALIAH UNIVERSITY
DEPARTMENT OF CIVIL ENGINEERING
Action Area II, Plot No. IIA/27, New Town, Kolkata 700160

In the online meeting of BoS held on 20/01/21. The detailed syllabus of B.Tech, framed by the faculty members of the department has been finalized.

Mohsin Jamal
Mohsin Jamal
(chairman BoS)

Signature of members of BoS:

W. Wasim
Md. Wasim akram

M. Raghob
Md. Raghob Adil

S. Khatunn
Dr. Supia Khatunn

N. Ahmad
Nihal Ahmad

A. Ghosh 20.01.2021
(AMBARISH GHOSH, IEST, Shibpur)

G. Bhandari
21.01.2021
(Dr. Gupinath Bhandari, JU)

N. Ali Khan
Dr. Nasim Ali Khan

G. Kibria
Dr. Golam Kibria

J. Sadak Ali
Dr. Jafar Sadak Ali

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S. Safayyad

**DETAILED SYLLABUS
FOR
B.TECH CIVIL ENGINEERING
(ALIAH UNIVERSITY)**

ESC	MENUGES 01	Engineering Mechanics	3L-1T-0P	4 Credits
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Upon completion of this course, students will be able to grasp the following concepts –

- Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
- Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
- Understand basic kinematics concepts – displacement, velocity and acceleration (and their angular counterparts);
- Understand basic dynamics concepts – force, momentum, work and energy;
- Understand and be able to apply Newton's laws of motion;
- Understand and be able to apply other basic dynamics concepts – the Work-Energy principle, Impulse – Momentum principle and the coefficient of restitution;
- Learn to solve dynamics problems choosing an appropriate solution strategy;
- Attain an introduction to basic machine parts such as pulleys and mass-spring systems etc.

Module	Content	Lecture
Module 1	Importance of Mechanics in engineering. Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force as a vector; Transmissibility of a force.	3
	Introduction to Vector Algebra; Parallelogram law; Lami's theorem; Co-ordinate representation of vector; Cross product and Dot product and their applications.	3
	Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces	4
Module 2	Concept and Equilibrium of forces; Free body concept and diagram; Equations of equilibrium, plane frames and trusses.	4
	Concept of Friction; Coulomb friction; Angle of Repose; Coefficient of friction	4
Module 3	Distributed Force: Centroid and Centre of Gravity; Centroids, circular sector, quadrilateral, composite areas consisting of different figures.	4
	Moments of inertia: Parallel axis theorem; Perpendicular axis theorem; Mass moment of inertia of symmetrical bodies e.g. cylinder, sphere, cone etc.	4
	Concept of virtual work and energy; Concept of simple stresses and strains; Torsion; Concept of fluid statics	4
Module 4	Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t, v-t and a-t graphs.	4

	Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion). Relative motion.	4
Module 5	Kinetics of particles: Newton's second law; Equation of motion; D'Alembert's principle and free body diagram; Principle of work and energy; Principle of conservation of energy; Power and efficiency; Impulse and Momentum.	6
Module 6	Steady flow; Vibration	2

Books Recommended:

1. Engineering Mechanics [Vol I & II] by Meriam & Kraige – Wiley India
2. Engineering Mechanics: Statics & Dynamics by R.C. Hibbeler – Pearson
3. Vector Mechanics for Engineers [Vol I & II] by F. P. Beer and E. R. Johnston, TMH
4. Engineering Mechanics by Timoshenko, Young and Rao – TMH

ESC	ECEUGES01	Basic Electronics Engineering (for CEN,MEN & CSE)	3L-0T-0P	3 Credits
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Module	Content	Lecture
Module 1	Semiconductor Basics: Energy band theory, Fermi levels, Conductors, Semiconductors and Insulators: electrical properties, Semiconductors: intrinsic and extrinsic, P-type and N-type semiconductors; electrical conduction phenomenon, drift and diffusion carriers, mass action law.	7
Module 2	Rectifying Devices: Formation of P-N junction, formation of depletion zone, Junction capacitance-I characteristics, Zener breakdown, Avalanche breakdown. Linear piecewise model; rectifiers: half wave, full wave, ripple factor, efficiency, Clipper and Clamper circuits	6
Module 3	Transistors: Formation of PNP / NPN junctions, principle of operation, configurations, transistor characteristics. Biasing and Bias stability: small signal low frequency operation of transistors; equivalent circuits h parameters, Transistors as amplifier: voltage gain, current gain, input impedance and output impedance, Decibel power.	7
Module 4	Field Effect Transistor: Construction and characteristics of JFET and MOSFET characteristics; depletion and enhancement type, FET small signal model.	4
Module 5	Feed Back Amplifier: Block diagram, properties, positive and negative feedback, loop gain, topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities(qualitative),bandwidth stability	4
Module 6	Operational Amplifier: Introduction to integrated circuits, operational amplifier and its terminal properties; concept of virtual earth, Gain-frequency and Slew rate; inverting and non-inverting mode of operation, voltage summing, difference, voltage follower, integrator, and differentiator.	4
Module 7	Electronic Instruments: Principle of operation of CRO; Electron ballistics and electron beam deflection; Concept of time base; Measurement of voltage, and frequency.	4

Text Books:

1. Rakshit & Chattopadhyay, Foundation of Electronics, New Age
2. Cathey, Electronic Devices and Circuits, Shaum series, TMH
3. Boylestead & Nashlesky, Electronic Devices and Circuits, Pearson
4. Millman and Halkias, Integrated Electronics, TMH

BSC	MATUGBS01	Engineering Mathematics I	4L-0T-0P	4L-0T-0P
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Module	Content	Lecture
Module 1	Basics of sequence and series ; Power series, Limit, Continuity.	14
Module 2	Differentiation, Mean value theorems and its application; Taylor's theorem, Maclaurin's infinite series; Maxima and minima; L Hospital's rule.	12
Module 3	Reduction formulae, Beta and Gama functions.	2
Module 4	Lines and planes, Polar coordinates, Quadric surfaces, Volume, Area, length.	10
Module 5	Continuity, Differentiability of vector functions, Arc length; Curvature, Torsion, Serret-Frenet formulas, Double, triple integrals, Jacobian .	10
Module 6	Green theorem, Gauss theorem and Stokes Theorems and its application.	6

References Book:

1. Advanced Engineering Mathematics : Erwin Kreyszig
2. Advanced Engineering Mathematics : R.K. Jain & S. R. K lyengar
3. Advanced Engineering Mathematics : C. R. Wylle & L. C. Barrett
4. Differential & Integral Calculus : N. Plskunov

BSC	PHYUGBS01	Engineering Physics	3L-0T-0P	3 Credits
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Module	Content	Lecture
Module 1	<p>Mechanics</p> <p>Classical mechanics: scalars and vectors, vector multiplication, central force, mechanics of system of particles, elastic properties, rotational motion, fluid dynamics: viscosity, Stoke's law, streamline flow, equation of continuity, Reynold's number, Bernoulli's theorem</p> <p>Quantum mechanics: Photoelectric effect, de-Broglie's hypothesis, matter wave, Hysenberg's uncertainty principle, wave function, Schrodinger equation and simple problems</p> <p>Statistical mechanics: Necessity of statistical mechanics, Maxwell-Boltzman, Bose-Einstein and Fermi-Dirac distribution formula</p>	12
Module 2	<p>Optics</p> <p>Huygen's principle, Interference of light, Young's double-slit experiment, Newton's ring; Diffraction: Fresnel and Fraunhofer class, Fresnel's half-period zones, zone plate, Fraunhofer diffraction due to single slit and plane transmission grating (elementary theory); Polarization: plane, circular and elliptically polarized light, Brewster's law, Polaroid, optical activity.</p> <p>Coherence length and time; Einstein's A and B coefficients; spontaneous and induced emissions, condition for laser action, population inversion, He-Ne laser</p> <p>Optical Fiber, core and cladding; total internal reflection; optical fiber and waveguide; communication through optical fiber, energy loss, attenuation and dispersion</p>	6
Module 3	<p>Electrostatics & Electricity</p> <p>Coulomb's law, intensity and potential of point charge, Gauss's theorem and simple applications, electric-dipole, Electric displacement, capacitor, parallel plates and cylindrical, Thermoelectricity, Magnetic effects of currents, Self-inductance, Mutual inductance, Transformer Electric circuit elements and AC, DC circuit analysis.</p>	6
Module 4	<p>Solid State Physics</p> <p>Crystalline nature of solid, diffraction of X-ray, Bragg's law, Mosley's law, explanation from Bohr's theory, Origin of the energy gap, band theory; metal, semiconductor and insulators; intrinsic and extrinsic semiconductors, dia, para and ferro magnetic materials, superconductivity</p>	6
Module 5	<p>Nuclear Physics</p> <p>Binding energy of nucleus, Binding energy curve and stability, Radioactivity, successive disintegration, radioactive equilibrium, radioactive dating, radioisotope and their uses, Nuclear transmutation, fission & fusion, nuclear reactor</p>	6

ESC	CENUGES01	Engineering Graphics & Design	1L-0T-3P	2.5 Credits
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Module	Content	Lecture
Module 1	<p>Introduction to Engineering Graphics: Drawing instruments and accessories, BIS – SP 46. Use of plane scales, Diagonal Scales and Representative Fraction.</p> <p>Engineering Curves: Classification and application of Engineering Curves, Construction of Conics, Cycloid Curves, Involutives and Spirals along with normal and tangent to each curve.</p>	30
Module 2	<p>Projections of Points and Lines: Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length and inclination with the reference planes.</p> <p>Projections of Planes: Projections of planes (polygons, circle and ellipse) with its inclination to one reference plane and with two reference planes, Concept of auxiliary plane method for projections of the plane</p>	30
Module 3	<p>Projections of Solids and Section of Solids: Classification of solids. Projections of solids (Cylinder, Cone, Pyramid and Prism) along with frustum with its inclination to one reference plane and with two reference planes. Section of such solids and the true shape of the section</p>	20
Module 4	<p>Drawing practice: Drawing practise using software like AUTO CAD</p>	20

Reference Books:

1. A Text Book of Engineering Graphics by P.J.Shah S.Chand & Company Ltd., New Delhi.
2. Elementary Engineering Drawing by N.D.Bhatt Charotar Publishing House, Anand.
3. A text book of Engineering Drawing by R.K.Dhawan, S.Chand & Company Ltd., New Delhi.

ESC	ECEUGES02	Basic Electronics Engineering Lab (for CEN,MEN & CSE)	0L-0T-3P	1.5 Credits
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Module	Content	Lecture
Module 1	Familiarization of Electrical and Electronics Components	3
Module 2	Familiarization of Various Instruments like Power Supply, Digital Multimeter, Function	3
Module 3	Generator, CRO etc.	3
Module 4	Study of Junction Diode Characteristics	3
Module 5	Study of Zener Diode Characteristics	3
Module 6	Study of Clipping Circuits	3
Module 7	Study of Clamping Circuits	3
Module 8	Study of Rectifier Circuits	3
Module 9	Study of BJT Characteristics	3
Module 10	Study of FET Characteristics	3
Module 11	Study of fundamental characteristics of OP-AMP	3
Module 12	Determination of Slew rate and bandwidth of an OP-AMP.	3

BSC	PHYUGBS02	Engineering Physics Lab	0L-0T-3P	1.5 Credits
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Module	Content	Lecture
Module 1	Measurements of length (or diameter) using vernier scale, slide caliper, screw gauge and travelling microscope.	3
Module 2	Determination of the radius of curvature of a spherical surface by using spherometer.	3
Module 3	Determination of moment of inertia of (a) a cylinder and (b) a rectangular solid bar.	3
Module 4	To determine the focal length of a concave lens by combination method and hence to determine the refractive index of the material of the lens by measuring the radii of curvature of both lenses	3
Module 5	Determination of the average resistance per unit length of the meter bridge wire by Carey-Foster's method and hence to determine an unknown resistance	3
Module 6	Determination of the horizontal component of the earth's magnetic field and the magnetic moment of a magnet by employing magnetometers	3
Module 7	Determination of Young's Modulus of elasticity of a material of a bar by the method of flexure.	3
Module 8	Determination of rigidity modulus of a material of a wire by static method.	3
Module 9	Determination of rigidity modulus of a material of a wire by dynamic method.	3
Module 10	Determination of unknown frequency of a tuning fork by using a sonometer.	3

ESC	CSEUGES01	Programming for Problem Solving	3L-0T-0P	3 Credits
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Module	Content	Lecture
Module 1	Introduction to computing: block architecture of a computer, bit, bytes, memory, and representation of numbers in memory.	1
Module 2	Introduction to problem solving: Basic concepts of an algorithm, program design methods, flowcharts.	1
Module 3	Introduction to C programming: A Brief History of C, C is middle-level Language, is a Structured Language, Compiler Vs Interpreters, The Form of a C Program, Library & Linking, Compilation & Execution process of C Program . [2]	2
Module 4	Variables, Data Types, Operator & Expression: Character Set, Token, Identifier & Keyword, Constant, Integer, Floating Point, Character, String, Enumeration, Data Types in C, Data Declaration & Definition Operator & Expression, Arithmetic, Relational, Logical, Increment & Decrement, Bit wise, Assignment, Conditional, Precedence & Associability of Operators.	3
Module 5	Console I/O: Introduction, Character input & Output, String Input & Output, Formatted Input/Output (scanf/printf), sprintf & sscanf.	2
Module 6	Control Statement: Introduction, Selection Statements, Nested if, if-else-if, The “?” Alternative, The Conditional Expression, switch, Nested switch, Iteration Statements, for loop, while loop, do-while loop, Jump Statements, Goto & label, break & continue, exit() function.	4
Module 7	Array & String: Single Dimension Arrays, Accessing array elements, Initializing an array, Multidimensional Arrays, Initializing the arrays, Memory Representation, Accessing array elements, String Manipulation Functions, searching, sorting an array.	6
Module 8	Function: Introduction, advantages of modular design, prototype declaration, Arguments & local variables, Returning Function Results by reference & Call by value, passing arrays to a function, Recursion.	4
Module 9	Storage Class & Scope: Meaning of Terms, Scope - Block scope & file scope, Storage Classes Automatic Storage, Extern Storage, Static, Storage, Register Storage.	2
Module 10	Pointers: Introduction, Memory Organization, The basics of Pointer, The Pointer operator Application of Pointer, Pointer Expression, Declaration of Pointer, Initializing Pointer, De-referencing Pointer, Void Pointer,	4

	Pointer Arithmetic, Precedence of &, * operators Pointer to Pointer, Constant Pointer, Dynamic memory allocation, passing pointer to a function, array of pointers, accessing arrays using pointers, handling strings using pointers.	
Module 11	Structure, Union, Enumeration & typedef: Structures, Declaration and Initializing Structure, Accessing Structure members, Structure, Assignments, Arrays of Structure, Passing, Structure to function, Structure Pointer, Unions.	2
Module 12	C Preprocessor: Introduction, Preprocessor Directive, Macro Substitution, File Inclusion directive, Conditional Compilation.	2
Module 13	File handling: Introduction, File Pointer, Defining & Opening a File, Closing a File, Input/Output Operations on Files, Operations on Text mode files and binary mode files, Error Handling During I/O Operation, Random Access To Files, Command Line Arguments	3

Suggested Books:

1. B.S. Gottfried: Programming in C; TMH.
2. B.W. Kernighan and D.M. Ritchie: The C Programming Language; PHI.
3. H. Schildt: C++: The Complete Reference; TMH, 4e.
4. B. Stroustrup: The C++ Programming Language; Addison-Wesley.
5. E. Balagurusamy: Programming in ANSI C; TMH.
6. Yashwant Kanetkar: Let Us C; BPB Publications.
7. K. N. King: C Programming: A Modern Approach, W. W. Norton and Company.
Pradip Dey and Manas Ghosh: Programming in C, Oxford University Press

ESC	EENUGES01	Basic Electrical Engineering (CSE,CEN & MEN)	3L-0T-0P	3 Credits
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Module	Content	Lecture
Module 1	Introduction: Basic concepts of Electrostatics and Electromagnetic.	4
Module 2	DC Circuit: Introduction of Electric Circuit & Elements, Loop Analysis, Node analysis, Star (Y) - Delta (Δ) & Delta (Δ)-Star (Y) Transformations.	6
Module 3	DC Network Theorem: Superposition Theorem, Thevenin's theorem, Norton's theorems, Maximum Power Transfer Theorem, Reciprocity Theorem, Time-domain analysis of first-order RL and RC circuits.	8
Module 4	Single-phase AC Circuits Generation of Sinusoidal Voltage Waveform (AC) and Some Fundamental Concepts, Representation of Sinusoidal Signal by a Phasor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.	8
Module 5	Transformer: Definition, working principle & construction, EMF equation, Equivalent circuit, Open circuit & Short circuit tests, Efficiency & Regulation.	4
Module 6	DC Machines: Constructional Features of D.C Machines , Principle of Operation of D.C Machines, EMF & Torque Equation , D.C Generators, D.C Motors, Losses, Efficiency, 3-point Starter and speed control of DC shunt Motor.	4
Module 7	Three-phase Induction Motor: Introduction to 3-phase induction motor	1
Module 8	Introduction to Power System: Basic concepts of Power System	1

BSC	MATUGBS02	Engineering Mathematics II	4L-0T-0P	4 Credits
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Module	Content	Lecture
Module 1	Matrices: Matrix operations (Addition, Multiplication, Transpose), invertible matrix.	4
Module 2	Determinant and their properties.	2
Module 3	Row reduced echelon form; Rank of a matrix. Solution of the matrix equation $Ax = b$; Cramer's rule. Eigenvalues and eigenvectors, characteristic polynomial of a matrix, Cayley–Hamilton theorem and its application. Linear dependence and independence of vectors, basis and dimension. Complex numbers and Complex integrals. Inequalities, Theory of equations.	32
Module 4	Complex numbers and Complex integrals. Inequalities, Theory of equations.	18
Module 5	Differential equation of first order and first degree: Exact, separable and homogeneous differential equations, Bernoulli's equation, ODEs of first order but not of first degree; Clairaut's equation.	7
Module 6	Higher order linear equation with constant coefficients: Complementary function, Particular integral, Symbolic Operator D.	4
Module 7	Method of undetermined coefficients, Euler's homogeneous equation and deduction to an equation of constant coefficients.	4
Module 8	Second order linear equation with variable coefficients: exact equation: reduction of order; variation of parameters; reduction to normal form; change of independent variables. Simple eigenvalue problems.	4
Module 9	System of linear differential equations with constant coefficients.	2

References:

1. Advanced Engineering Mathematics : Erwin Kreyszig
2. Advanced Engineering Mathematics : R.K. Jain & S. R. K lyengar
3. Advanced Engineering Mathematics : C. R. Wylle & L. C. Barrett
4. Differential & Integral Calculus : N. Plskunov

BSC	CHMUGBS01	Engineering Chemistry	3L-0T-0P	3Credits
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Module	Content	Lecture
Module 1	Thermodynamics : Importance and scope, definitions of system and surroundings; type of systems; Extensive and intensive properties; Steady state and equilibrium; Zeroth law of thermodynamics; First law of thermodynamics, internal energy and Enthalpy as a state function; Second law of thermodynamics; Kelvin, Planck and Clausius statements; Carnot cycle and refrigerator; Carnot's theorem; Physical concept of entropy.	
Module 2	Water and its treatment : Sources of water, Impurities in water, Hardness of water, Determination of hardness of water, Water quality parameter, Treatment of water for domestic purpose, Waste water.	
Module 3	Polymers : Terminology, Classification of polymers, Polymerization techniques, Molecular weight of polymers, Plastics, Rubbers, Fibers, Conducting and semiconducting polymers, Natural polymers.	
Module 4	Green Chemistry : Definition and concept of green chemistry, Emergence of green chemistry, Alternative solvents, Design of safer chemicals, Microwave radiation of green synthesis, Green laboratory Technology.	

Books referred

1. K. S. Maheswaramma and M. Chugh, Engineering Chemistry, Pearson, 2016.
2. Wiley Engineering Chemistry, Wiley, 2nd Edn., 2014.

HSMC	ENGUGHU01	Communicative English	3L-0T-0P	3Credits
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Objectives of the Course: To impart basic Communication skills to the first year UG students in the English language through rigorous practice and use of various categories of common words and their application in sentences; to enable them to achieve effective language proficiency for their social, professional & inter personal communication both in speaking & writing.

Module	Content	Lecture
Module 1	Fundamentals of Communication: Communication: Meaning, Nature, Process, Importance and Function of Communication; Levels of Communication: Intra-personal, Interpersonal, Organizational, Mass Communications; The Flow of Communication: Downward, Upward, Lateral or Horizontal, Diagonal, Grapevine Communication; Network in an Organization; Principles for Effective Communication; Verbal and Non-Verbal Communication; Barriers to Communication, Gateways to Communication.	
Module 2	Listening and Speaking Skills: The Process of Listening; Barriers to Listening; Types of Listening: Active and Passive Listening; Methods for improving listening skills, Benefits of Effective Listening. Presentation Strategies: Defining Purpose; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech – Accent, Pitch, Rhythm, Intonation, Strong and Weak Forms, Connected Speech- Assimilation and Elision, Paralinguistic Features of Voice; Articulation of Speech Sounds- Vowels and Consonants; Spelling and Pronunciation; Problems of Indian speakers of English and their remedial measures.	
Module 3	Reading and Writing Skills : Reading Skills: Purpose, Process, Methodologies, and Strategies; Special Reading Situations – Skimming and Scanning, Intensive and Extensive Reading, Critical Reading, Drawing Inferences, Reading Technical Reports, etc. Writing Skills: Words and Phrases: Word Formation, Synonyms and Antonyms, Homophones, One Word Substitutes, Words Often Confused, Word Choice - Right Words, Appropriate Words, Idioms and Phrases; Correct Usage: Parts of Speech, Modals, Concord, Articles, Infinitives, Requisites of Sentence Construction. Elements of Effective Writing, Main Forms of Written	

	Communication: Paragraph - Techniques and Methods (Inductive, Deductive, Linear, Spatial, Chronological etc.), The Art of Condensation- various types (Précis, Summary and Abstract, etc.), Description, Agenda, Minutes, Notices, Circulars, Memo, Advertisements, Drafting an E-mail, Press Release.	
Module 4	Business Communication: Business Letters: Principles; Sales & Credit letters; Claim and Adjustment Letters; Job application and Résumés. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal. Negotiation & Business Presentation skills.	

Suggested Readings:

1. Sethi, J & et al. *A Practice Course in English Pronunciation*, Prentice Hall of India, New Delhi.
2. Berry Cicely: *Your Voice and How to Use it Successfully*, George Harp & Co. Ltd, London
3. Bansal, R.K. and J.B. Harrison. *Spoken English*, Orient Longman.
4. Hornby's, A.S. *Oxford Advanced Learners Dictionary of Current English*, 7th Edition.
5. Pillai, Sabina & Agna Fernandez: *Soft Skills & Employability Skills*. Cambridge Univ. Press.
6. Sudharshana, N.P. & C. Savitha: *English for Technical Communication*, Cambridge Univ. Press.
7. Raman, Meenakshi & Sangeeta Sharma: *Technical Communication: Principles and Practice*. Oxford Univ. Press.
8. Prasad, P. *The Functional Aspects of Communication Skills*, Delhi.
9. McCarthy, Michael. *English Vocabulary in Use*, Cambridge University Press, Cambridge.
10. Leech, G & Svartvik, J. *A Communicative Grammar of English*. Pearson Education. New Delhi.
11. Narayanaswamy V.R. *Strengthen your Writing*. Orient Longman, London.
12. Dean, Michael. *Write it*, Cambridge University Press, Cambridge.
13. Sen, Leena. *Communication Skills*, Prentice Hall of India, New Delhi.
Bown, G. *Listening and Spoken English*, Longman, London

ESC	CSEUGES02	Programming for Problem Solving Lab	OL-0T-4P	2 Credits
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Content

Primary goal of this course is to make acquaint the students to know the programming language and also to know how 'C' can be used to write serious program to solve the problems. Programs will be based on the theoretical paper and to cover the concept of basic arithmetic operations, control statements, functions, recursions, arrays, strings, pointers, structures, unions, file handling etc.

Suggested Books:

1. B.S. Gottfried: Programming in C; TMH.
2. B.W. Kernighan and D.M. Ritchie: The C Programming Language; PHI.
3. H. Schildt: C++: The Complete Reference; TMH, 4e.
4. B. Stroustrup: The C++ Programming Language; Addison-Wesley.
5. E. Balagurusamy: Programming in ANSI C; TMH.
6. Yashwant Kanetkar: Let Us C; BPB Publications.
7. K. N. King: C Programming: A Modern Approach, W. W. Norton and Company.
8. Pradip Dey and Manas Ghosh: Programming in C, Oxford University Press

ESC	EENUGES02	Basic Electrical Engineering Lab (CSE,CEN & MEN)	0L-0T-3P	1.5 Credits
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Module	Content	Lecture
Module 1	Verification of Thevenin's Theorem	3
Module 2	Verification of Norton's Theorem	3
Module 3	Verification of Superposition Theorem	3
Module 4	Power Measurement of Fluorescent Lamp	3
Module 5	V-I characteristics of Incandescent Lamp	3
Module 6	Speed Control of DC motor Using Field and Armature Control Method	3
Module 7	Starting and reversing of DC motor	3
Module 8	Open circuit and Short circuit test of Single Phase Transformer	3
Module 9	Calibration of Voltmeter and Ammeter	3
Module 10	Characteristics of Series R-L-C Circuit	3
Module 11	Characteristics of Parallel R-L-C Circuit	3
Module 12	Resistance measurement and continuity test of DC motor using Megger	3

ESC	MENUGES02	Workshop Practice	0L-1T-2P	2 Credits
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Module	Content	Lecture
Module 1	Introduction to various hand tools e.g. allen keys, spanners, punch, files, hacksaw, hammers, chisels, vices, marking block, angle plates, etc.	
Module 2	Introduction to basic instruments: Vernier Caliper, Micrometer, Tri-square, Surface Plate, Height Gauge, Vernier Bevel Protractor, Screw Pitch Gauge, Radius Gauge, etc.	
Module 3	Demonstration on different machines and Equipments: Lathe, Milling, Drilling, Shaping, Radial Drilling, Grinding, Welding, Power Saw, Power Press, Planer Machine, Microscope, Profile Projector, etc.	
Module 4	Practical Exercises: Exercises involving the following operations: measuring and marking, sawing, chipping, filing, maintaining of perpendicularity of all surfaces by filing, making of taper surface by filing, making of curved surface by filing, plain turning, step turning and drilling.	

Reference books

1. Hazra Choudhury & Hazra Choudhury – Elements of Workshop Technology, Vol. I & II – Media Promoters and Publishers Pvt. Ltd.
2. Rajender Singh - Introduction to Basic Manufacturing Process and Workshop Technology, New Age International.

BSC	CHMUGBS02	Engineering Chemistry Lab	0L-0T-3P	1.5 Credits
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Module	Content	Lecture
Module 1	Acidimetric estimation of Sodium Carbonate and Sodium bi-Carbonate in their mixture.	3
Module 2	Estimation of Total Hardness of water by Complexometric method	3
Module 3	Estimation of Fe ^{II} in Mohr's Salt by Permanganometric Titration.	3
Module 4	Qualitative analysis of single solid organic compounds.	3

HSMC	ENGUGHU02	Language Lab	0L-0T-2P	1 Credits
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Objectives of the Course: To impart basic Communication skills to the first year UG students in the English language through rigorous practice and use of various categories of common words and their application in sentences; to enable them to achieve effective language proficiency for their social, professional & inter personal communication both in speaking & writing; to improve their English pronunciation.

Module	Content	Lecture
Module 1	Group Discussion: Practical based on Accurate and Correct Grammatical Patterns.	
Module 2	Conversational Skills under suitable Professional Communication Lab conditions with emphasis on Kinesics: Interview, Greeting and Introducing, Leave taking, Asking Questions and Giving Replies, Inviting Friends and Colleagues, Negotiating, Persuading, Taking Initiatives, Praising and Complementing People, Expressing Sympathy, Seeking and Giving Permission, Complaining and Apologizing, Official/Public Speaking, Telephoning etc.	
Module 3	Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistic/ Kinesics.	
Module 4	Presentation Skills for Technical Paper/Research Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics	
Module 5	Extempore, Argumentative Skills, Role Play Presentation with Stress and Intonation.	
Module 6	Comprehension Skills based on Reading and Listening Practical on a model Audio-Visual Usage.	

Reference Books

1. Bansal R.K. & Harrison: *Phonetics in English*, Orient Longman, New Delhi.
2. Sethi & Dhamija: *A Course in Phonetics and Spoken English*, Prentice Hall, New Delhi.
3. Pandey, L.U.B. & R.P.Singh: *A Manual of Practical Communication*, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans, Daniel, *Cambridge English Pronouncing Dictionary*, Cambridge Univ. Press.
5. Sudharshana, N.P. & C. Savitha: *English for Technical Communication*, Cambridge Univ. Press

HMC	(CENUGHU01)/ (CE207)	(Introduction to Civil Engineering)	2L:0T:0P	2 credits
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Objective

When the students enter the college to pursue a degree in Civil Engineering and as well pursue a career in Civil Engineering after graduation, they need to understand the breadth and depth available in this field for possible engagement. When many alternative disciplines of engineering appear to offer apparently more glamorous avenues for advancement, the Civil Engineering student should realize the solid foundations available in this mother of all engineering disciplines. The students should understand the enormous possibilities available for creative and innovative works in this all pervasive field of engineering.

Proposed Syllabus:

What is Civil Engineering/ Infrastructure, History of Civil Engineering, Overview of ancient & modern civil engineering marvels, current national planning for civil engineering/ infrastructure projects, scope of work involved in various branches of Civil Engineering – Architecture & Town planning, Surveying & Geomatics, Structural Engineering, Construction Management, Construction materials, Hydrology and Water Resources Engineering, Hydraulic Engineering, Environmental Engineering & Sustainability, Pavement Engineering and construction, Traffic & Transportation Engineering and Management, Geotechnical Engineering, Ocean Engineering, Building Energy Efficiency, Basics of Contract Management, Professional Ethics, Avenues for entrepreneurial working, Creativity & Innovativeness in Civil Engineering,

Text/Reference Books:

1. Patil, B.S.(1974), Legal Aspects of Building and Engineering Contract
2. The National Building Code, BIS, (2017)
3. RERA Act, (2017)
4. Meena Rao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset
5. Chandiramani, Neelima (2000), The Law of Contract: An Outline, 2nd Edn. Avinash Publications Mumbai
6. Avtarsingh (2002), Law of Contract, Eastern Book Co.
7. Dutt (1994), Indian Contract Act, Eastern Law House
8. Anson W.R.(1979), Law of Contract, Oxford University Press
9. Kwatra G.K.(2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration
10. Avtarsingh (2005), Law of Arbitration and Conciliation, Eastern Book Co.

11. Wadhwa (2004), Intellectual Property Rights, Universal Law Publishing Co.
12. P. S. Narayan (2000), Intellectual Property Rights, Gogia Law Agency
13. T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House
14. Bare text (2005), Right to Information Act
15. O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers
16. K.M. Desai(1946), The Industrial Employment (Standing Orders) Act
17. Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House
18. 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
19. American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study and Application
20. Ethics in Engineering- M.W.Martin& R.Schinzinger, McGraw-Hill
21. Engineering Ethics, National Institute for Engineering Ethics, USA
22. www.ieindia.org
23. Engineering ethics: concepts and cases – C. E. Harris, M.S. Pritchard, M.J.Rabins
24. Resisting Bureaucratic Corruption: Alacrity Housing Chennai (Teaching Case Study) -S. Ramakrishna Velamuri -CEIBS
25. CONSTRUCTION CONTRACTS, <http://www.jnormanstark.com/contract.htm>
26. Internet and Business Handbook, Chap 4, CONTRACTS LAW, <http://www.laderapress.com/laderapress/contractslaw1.html>
27. Contract &Agreements , <http://www.tco.ac.ir/law/English/agreements/General/Contract%20Law/C.htm>
28. Contracts, <http://206.127.69.152/jgretch/crj/211/ch7.ppt>
29. Business & Personal Law. Chapter 7. “How Contracts Arise”, <http://yucaipahigh.com/schristensen/lawweb/lawch7.ppt>
30. Types of Contracts, <http://cmsu2.cmsu.edu/public/classes/rahm/meiners.con.ppt>
31. IV. TYPES OF CONTRACTS AND IMPORTANT PROVISIONS, <http://www.worldbank.org/html/opr/consult/guidetxt/types.html>
32. Contract Types/Pricing Arrangements Guideline- 1.4.G (11/04/02), <http://www.sandia.gov/policy/14g.pdf>

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

PCC	(CENUGPC01)/ (CE201)	Mechanics of Materials	2L:1T:0P	3 credits
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Objective

The objective of this Course is to provide an understanding of all kinds of stresses, deformations, and how to calculate them in a wide range of simple, practical structural problems, and an understanding of the mechanical behaviour of materials under various load conditions.

Proposed Syllabus:

Simple Stresses and Strains - Concept of stress and strain, Elasticity and plasticity – Types of stresses and strains, Hooke’s law, stress – strain diagrams, Poisson’s ratio and volumetric strain, Relationship between elastic constants, Compound Stresses and Strains- Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, Bending moment and Shear Force Diagrams, Determination of bending stresses – Section modulus, Shear stress distribution across various beam sections, Slope and deflection- Moment area method, Macaulay’s method, Stability of Columns, Euler’s formula, end conditions and effective length factor, Columns with eccentric and lateral load, Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion, Thin and thick Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

Text/Reference Books:

- 1) Timoshenko, S. and Young, D. H., “Elements of Strength of Materials”, DVNC, New York, USA.
- 2) Kazmi, S. M. A., ‘Solid Mechanics” TMH, Delhi, India.
- 3) Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004
- 4) Gere, J. M., and S. P. Timoshenko. *Mechanics of Materials*. 5th ed. Boston: PWS Kent Publishing, 1970.

Outcomes:

- The students will be able to understand the mechanical behaviour of materials under different loading conditions.
- They will have make use of capabilities forces and moments for design.
- They will have knowledge of engineering principles to apply in civil engineering principles.

PCC	(CENUGPC02)/(CE203)	Surveying & Geomatics	2L:1T:0P	3 credits
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Objective

The objective of this Course is to introduce the basic concepts of surveying and remote sensing integrated with geographical information system. This subject further focus on the determination of relative position of any objects or points of the earth, the distance and angle between the different objects and to prepare a map or plan to represent an area on horizontal plan.

Proposed Syllabus:

Introduction: Definition, classification of surveying, objectives, principles of surveying, Errors and Accuracy, Linear measurement and corrections. **Chain survey** -Chain and its types, ground features by offsets – Field book. Errors in chain surveying and their elimination: Problems. **Prismatic compass survey**- Local attraction and its adjustments, **Traversing:** Principles and Adjustments of Traverse, Problems. **Leveling:** Methods of leveling – Differential, Profile & fly Leveling, Effect of curvature and refraction, Automatic levels, Plotting longitudinal sections and Cross sections; **Theodolite:** Instrument Specifications, Adjustments and Principles of Angle Measurement, Trigonometric and Geodetic Survey. **Total Station** with Field applications. Introduction to **GPS, GIS** and **Remote Sensing**.

Text/Reference Books:

- 1) Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) Ltd., New Delhi.
- 2) Arora K R “Surveying Vol 1, 2 & 3), Standard Book House, Delhi, 2004.
- 3) Prof. T.P. Kenetkar and Prof. S.V. Kulkarni - Surveying and Levelling, Pune Vidyarthi Griha Prakashan,2004.
- 4) S.K. Duggal - Surveying Vol. II, Tata McGraw Hill Ltd ,Reprint 2015

Outcomes:

- Ability to apply the basic tools and technology to engineering and surveying activities
- Translate the knowledge gained for the implementation of Civil infrastructure facilities.
- Relate the knowledge on Surveying to the new frontiers of science, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing.

PCC	(CENUGPC03)/ (CE205)	Building Materials	3L:0T:0P	3 credits
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Objective

The objective of this Course is to deal with an experimental determination and evaluation of mechanical characteristics and advanced behavior of metallic and non-metallic structural materials. The course deals with explanation of deformation and fracture behavior of structural materials. The main goal of this course is to provide students with all information concerning principle, way of measurement, as well as practical application of mechanical characteristics.

Proposed Syllabus:

Bricks: Classification, Characteristics of bricks, ingredients of brick earth, testing of bricks as per BIS. **Aggregates:** Classification, Characteristics, Alkali –aggregates reaction, Fine aggregates, coarse aggregates, Testing of aggregates. **Lime:** Classification, Slaking and hydration, Hardening, Testing, Storage, Handling. **Cement and Concrete:** Cement, Chemical Composition of Cement, Hydration of Cement, Heat of Hydration and Strength, Tests on Cement, **Admixtures** – Different types, effects, uses, Retarders and Super plasticizers. Light-weight, Polymer and Fibre-reinforced concrete. **Mortars:** Classification, Uses, Characteristics of good mortar, Ingredients. **Wood and Wood Products, Paints, Enamels and Varnishes:** Composition of oil paint, characteristic of an ideal paint, preparation of paint, covering power of paints, Painting: Plastered surfaces, painting wood surfaces, painting metal Surfaces. **Wall, Doors and Windows, Foundations, Stairs, Flooring, Roofs, Brick & Stone Masonary. Formworks.**

Text/Reference Books:

- 1) Building Materials by Rangawala
- 2) Building Materials and Construction by B. C. Punmia
- 3) Building Construction and Foundation Engineering by Jha and Sinha
- 4) Concrete Technology by M. S. Shetty
- 5) Building Materials by S. K. Duggal
- 6) Building Materials by P.C. Varghese

Outcomes:

- Understand various conventional construction materials, properties and their uses.
- Describe various latest and modern construction methods and their applications.

MC	(UCCUGMC03)/CE 202	Indian Constitution	2L:0T:0P	0 credits
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Basic features and fundamental principles

The Constitution of India is the supreme law of India. Parliament of India can not make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of m“Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

Proposed Syllabus:

Module 1 Meaning of the constitution law and constitutionalism

Module 2 Historical perspective of the Constitution of India

Module 3 Salient features and characteristics of the Constitution of India

Module 7 . Federal structure and distribution of legislative and financial powers between the Union and the States

Module 8 Parliamentary Form of Government in India – The constitution powers and status of the President of India

Module 9 Amendment of the Constitutional Powers and Procedure

Module 10 The historical perspectives of the constitutional amendments in India

Module 11 Emergency Provisions : National Emergency, President Rule, Financial Emergency

Module 12 Local Self Government – Constitutional Scheme in India

Module 13 Scheme of the Fundamental Right to Equality

Module 14 . Scheme of the Fundamental Right to certain Freedom under Article 19

Module 15 Scope of the Right to Life and Personal Liberty under Article 21

PCC	(CENUGPC04)/ (CE281)	Estimating, Costing & Valuation	1L:0T:3P	2.5 credit
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Objective

The objective of this course is to determine the quantities of items and labour requirement of civil engineering works. Preparation of estimate of the civil engineering works. To introduce the students in depth knowledge of professional practice as well the quantity, analysis of construction works like, multi-storied structures, Water works & sanitary works, Irrigation works, Road estimates, culverts, etc.

Proposed Syllabus:

Introduction: Purpose of estimating and valuation, Types of estimates. Building Estimate: Main items and their unit of measurement, **Methods of Measurement**-Methods of estimating quantities, Estimating quantities of building. Estimation of quantity of load bearing structure with single room & two rooms, Estimation of quantity single storied residential building, Estimation of quantity Different R.C.C. structures , Estimation of quantity of water supply and sanitary works, Estimation of quantity of culverts and bridges, Road estimating, Estimation of quantity of Trusses. **Market Survey:** Traditional and modular materials, Market survey of materials of Construction, Wages of labour, Tools plant and equipment of construction. **Rate Analysis** : Prerequisites, factors affecting rate analysis, procedure for rate analysis, schedule of rates, Labour requirement for different works, material requirement for different works, Rate analysis of different Items of work. **Tenders And Contracts:** Tender notice, tender document, Terms and conditions of contract, **Valuation:** Purpose of valuation, types of property-Depreciation.

Text/Reference Books:

- 1) B. N. Dutta, Estimating and Costing In Civil Engineering, Ubs Publishers Distributors Ltd.
- 2) S. C. Rangwala, Estimating And Costing, Charotar Publishing House, Anand
- 3) G. S. Biridi, Textbook of Estimating & Costing, Dhanapat Rai & Sons. Delhi.
- 4) Aggarwal, A., Upadhyay, A.K., Civil Estimating, Costing & Valuation, S.K Kataria & Sons, New Delhi.
- 5) Chandola, S.P. and Vazirani, Estimating and Costing, Khanna Publication.

Outcome

- The students will be able to prepare tender documents.
- The students will be able to prepare estimates for various engineering structures.

PCC	(CENUGPC06)/(CE 202)	Fluid Mechanics & Hydraulics	3L:1T:0P	4 credits
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Objective

The objective of this course is to introduce fundamentals of static, kinematic and dynamic principle of mechanics and its application to stagnant and flowing fluid through different conduits.

Proposed Syllabus:

Introduction: Fluid properties, types of fluids, continuum principle. **Principles of Fluid Statics:** Basic equations, manometers, hydrostatic forces on submerged surfaces, buoyancy. **Kinematics of Flow:** Visualization of flow, types of flow, streamline, path line, streak line, principle of conservation of mass, velocity, acceleration, velocity potential and stream function, vorticity, circulation. **Fluid Dynamics:** Control volume approach, Euler's equation, Bernoulli's equation and its applications, momentum and angular momentum equations and their applications. **Pipe Flow & Boundary Layer Theory, Dimensional Analysis and Similitude:** Dimensional homogeneity, Buckingham's π theorem, dimensionless numbers, similitude,

Text/Reference Books:

- 1) Som, S.K. and Biswas, G., "Fluid Mechanics and Fluid Mechanics", Tata McGraw Hill.
- 2) Garde, R.J. and Mirajgaoker, A.G., "Engineering Fluid Mechanics", Nem Chand & Bros.
- 3) Fox, R.W. and McDonald, A.T., "Introduction to Fluid Mechanics", John Wiley & Sons.
- 4) Asawa, G.L., "Fluid Flow in Pipes and Channels", CBS Publishers.
- 5) Schlichting, H. and Gersten, K., "Boundary Layer Theory", Springer.
- 6) Streeter, V.L. and Benjamin, W.E., "Fluid Mechanics", McGraw-Hill.
- 7) Hydraulics And Fluid Mechanics Including Hydraulic Machines (In Si Units)by P.N. Modi, S.M. Seth.
- 8) A textbook of Fluid mechanics by R.K Bansal: Laxmi Publication

Outcome

- Understand the broad principles of fluid statics, kinematics and dynamics
- Enable to apply the continuity, momentum and energy principles on the flowing system through different conduits.
- Enable to apply principle of dimensional analysis for modelling various fluid behaviour on the hydraulic system.

PCC	(CENUGPC07)/(CE204)	Structural Analysis	3L:1T:0P	4 credits
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Objective

The objective of this course is to ensure that a structure has the proper strength, rigidity, safety, and deformations within permissible limit. The aim of this course is to integrate the disciplines of mechanics, dynamics, and failure theories to compute the internal forces and stresses on the structures to be designed.

Proposed Syllabus:

Introduction; Classification of structures; Determinate and Indeterminate structures, Strain energy, work done by forces, Total strain energy, Minimum potential energy, Castigliano's theorems, Classification of structural Analyses; Displacement method: Joint displacement method for trusses, slope displacement method for beams and frames, Force/compatibility/ method: Unit load method; Application to indeterminate trusses and frames; Moment distribution method, Influence lines and Moving loads; Different load cases, Influence lines for forces for determinate beams; Influence lines for pin-jointed trusses; Influence lines for indeterminate beams using Muller Breslau principle. Influence lines for Arches and stiffening girders.

Text/Reference Books:

- 1) Norris, C.H. and Wilber, J. B. and Utku, S. "Elementary Structural Analysis" McGraw Hill, Tokyo, Japan.
- 2) Wang C.K., Intermediate Structural Analysis, Tata McGraw Hill book Company, New Delhi
- 3) C.S. Reddy , Basic Structural Analysis - Tata McGraw Hill Pub. Co. Ltd. New Delhi.
- 4) Hibbler R C; Structural Analysis; Pearson

Outcome

- The students will be able to apply their knowledge of structural mechanics in addressing design problems of structural engineering
- They will possess the skills to solve problems dealing with different loads in concrete and steel structures.
- They will have knowledge in structural engineering.

PCC	(CENUGPC08)/ (CE206)	Design of RCC Structures	2L:1T:0P	3 credits
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Objective

The objective of this course is to perform analysis and design of reinforced concrete members, connections, and to be able to identify, and interpret the appropriate relevant industry design codes. Also to become familiar with professional and contemporary issues in the design and construction of reinforced concrete structures.

Proposed Syllabus:

Introduction; Study of the strength, behavior of reinforced concrete structures; Load and stresses, load combinations, Working stress and limit state approach. Analysis and design of sections in bending – working stress and limit state method, Rectangular and T-sections, Beams with reinforcement in compression, Design for shear and bond, Mechanism of shear and bond failure, Design of shear using limit state concept, Development length of bars; Design of sections in torsion. Design of one way and two-way slabs; Design of flat slab, Placement of reinforcement in slabs, Design of compression members; Short column, Columns with uni-axial and bi-axial bending, use of design charts, Design of foundation; Wall footing, Isolated and combined footing for columns.

Text/Reference Books:

- 1) Nilson, A. H. *Design of Concrete Structures*. 13th edition. McGraw Hill, 2004
- 2) MacGregor, J. G., *Reinforced Concrete: Mechanics and Design*, 3rd Edition, Prentice Hall, New Jersey, 1997.
- 3) Jain, A.K, *Design of Concrete Structure by Nem Chand & Bros.*; Seventh edition (2012)
- 4) Menon, P. *Reinforced Concrete Design*, Third Edition, McGraw Hill

Outcome

- The students will understand the general mechanical behavior of reinforced concrete.
- They will be able to analyze and design of reinforced concrete structures.
- They will possess the skills to solve problems dealing with different loads in concrete structures.

PCC	(CENUGPC09)/CE208	Engineering Geology	2L:0T:1P	2.5 credits
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Objective

The objective of this Course is to focus on the core activities of engineering geologists – site characterization and geologic hazard identification and mitigation. Through lectures, and case study examination student will learn to couple geologic expertise with the engineering properties of rock and unconsolidated materials in the characterization of geologic sites for civil work projects.

Proposed Syllabus:

Introduction-Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. **Mineralogy**-Mineral, Origin and composition. Physical properties of minerals. **Petrology**- Igneous petrology, Sedimentary petrology, Metamorphic petrology. **Physical Geology**- Weathering. Erosion and Denudation. **Strength Behavior of Rocks**- Dip and Strike. Outcrop, Inliers, Outliers, Fold, Faults, Joints & Unconformity, Importance of structural elements in engineering operations, Earthquake and Subsidence. **Rock masses as construction material**- Building stones, Road materials. **Geology of dam and reservoir site**-Required geological consideration for selecting dam and reservoir, site Favorable & unfavorable conditions in different types of rocks in presence of various structural features, precautions to be taken to counteract unsuitable conditions.

Text/Reference Books:

- 1) Engineering and General Geology, Parbin Singh, 8th Edition (2010), S K Kataria & Sons.
- 2) Text Book of Engineering Geology, N. Chenna Kesavulu, 2nd Edition (2009), Macmillan Publishers India.
- 3) Geology for Geotechnical Engineers, J.C.Harvey, Cambridge University Press (1982).

Outcome

- The Students will be able to do site characterization and how to collect, analyse, and report geologic data using standards in engineering practice
- The Students will be able to do rock mass characterization.

PCC	(CENUGPC12)/(CE301)	Design of Steel Structures	2L:1T:0P	3 credits
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Objective

The objective of this course is to learn the behavior and design of structural steel components (members, connections, trusses and frame structures) and to gain an educational and comprehensive experience in the design of simple steel structures.

Proposed Syllabus:

Introduction; Properties of materials, loads and stresses, Design of semi-rigid, rigid and moment resistant connections; Design of tension members subjected to axial tension and bending, splicing of tension member; Design of compression members, Built-up sections; Beam-column connections; Design of columns and their bases; Design of flexural members and Plate girder; loads, specification and design of Industrial buildings; loads, design of purlins, trusses, bracings; gantry girders; Introduction to Plastic analysis; Simple cases of beams and frames.

Text/Reference Books:

- 1) McCormac, J.C., Nelson, J.K. Jr., *Structural Steel Design*. 3rd edition. Prentice Hall, N.J., 2003.
- 2) Design of steel structure by Arya&Ajmani, NEM CHAND & BROS; 2015 edition
- 3) Duggal, S.K. Limit State Design of Steel Structures, Second Edition, McGraw Hill

Outcome

- The students will understand the general mechanical behavior of steel structures.
- They will be able to design members and connections of steel structures.
- They will possess the skills to solve problems dealing with different loads in steel structures.

PCC	(CENUGPC13)/(CE303)	Open Channel Flow	2L:1T:0P	3 credits
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Objective

The objective of this course is to introduce the basic hydraulic phenomenon in open channel system. This subject explains the type, behaviour and governing principle in open channel system.

Proposed Syllabus:

Introduction: Difference between open channel flow and pipe flow, classification of flow in Channels, geometrical parameters of a channel, continuity equation, Momentum equation and Energy equation. **Specific Energy:** Critical depth, concepts of specific energy and specific force, Alternate depths, Conditions for maximum discharge and Channel transition. **Uniform flow,** Chezy's and Manning's equations for uniform flow in open channel, velocity distribution, most efficient channel section. **Non-Uniform Flow:** Equation of gradually varied flow and its limitations, flow classification and surface profiles, Hydraulic jump: loss of energy and length, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions. integration of varied flow equation by analytical, graphical and numerical methods, flow in curved channels.

- 1) Chow, V.T., "Open Channel Hydraulics", McGraw Hill.
- 2) Chaudhry, M.H., "Open Channel Flow", Prentice-Hall, New Jersey, USA.
- 3) Chanson, H., "The Hydraulics of Open Channel Flow: An Introduction", Elsevier Scientific.
- 4) Subramanya, K., "Flow in Open Channels", Tata McGraw-Hill.
- 5) Ranga Raju, K.G., "Flow through Open Channels", Tata McGraw-Hill.

Outcome

- Ability to develop the open channel flow equations from the basic conservation equations.
- Ability to identify, analyze and design the various hydraulic structures associated with open channel system.

PCC	(CENUGPC14)/(CE305)	Soil Mechanics	2L:1T:0L	3 credits
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Objective

This course seeks to provide an introduction to the mechanics of soil, its engineering behaviour and various properties which predicts the quality of the soil as foundation material or construction material. Through lectures, and laboratory experiment student will learn to understand soil behavior with the mineralogy present and also be able to do seepage analysis for finding discharge calculation and stability of structure.

Proposed Syllabus:

Introduction to geotechnical engineering, Formation and types of soil, Weight and volume relationships, Consistency limits, particle size distribution, Identification and classification of soil, Soil structure and clay mineralogy, Soil water suction and capillary rise, effective and pore water pressure, Permeability and ground water flow–Darcy's law, factors affecting permeability. Laboratory and field determination of permeability, permeability of stratified deposits. Seepage pressure; quick condition, Laplace's equation; construction and use of flow nets, piping and heaving, Stresses in soils – 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. Contact pressure under rigid and flexible area, computation of displacements from elastic theory, Compaction of soil–compaction phenomena, laboratory compaction test and field compaction control, Compressibility and consolidation of soil–Terzaghi's theory of one-dimensional consolidation.

Text/Reference Books:

- Basic and Applied Soil Mechanics by Gopal Ranjan and A.S.R. Rao
- Engineering (Civil and Environmental Engineering) by V.N.S. Murthy
- Soil Mechanics and Foundations by B.C.Punmia,, Ashok Kumar Jain and arun Kumar Jain
- Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation
- Soil Mechanics by Craig R.F., Chapman & Hall
- Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
- Essentials of Soil Mechanics and Foundations: Basic Geotechnics by David F. McCarthy

Outcome

- Ability to describe about the origin & formation of soil
- An ability to demonstrate the particle size distribution
- An ability to do the Index Properties of Soil
- An ability to demonstrate about the soil Classification
- Ability to describe about the soil moisture .

PCC	(CENUGPC15)/ (CE307)	Transportation Engineering	2L:1T:0P	3 credits
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Objective

An introduction to highway engineering. The capability to know about the highway alignment. The ability to know about the highway geometric design. An understanding about the pavement design. The introduction to pavement construction technique. An understanding about the special problems on highways.

Proposed Syllabus:

Highway development and planning-Classification of roads, road development in India, Current road projects in India; highway alignment and project preparation, Geometric design of highways-: Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems, 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, 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, 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.

Text/Reference Books:

1. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros, 2017
2. Kadiyalai, L.R., 'Traffic Engineering and Transport Planning', Khanna Publishers.
3. Partha Chakraborty, 'Principles of Transportation Engineering, PHI Learning,
4. Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski, 'Principles of Highway Engineering and Traffic Analysis', 4th Edition, John Wiley
5. Srinivasa Kumar, R, Textbook of Highway Engineering, Universities Press, 2011.
6. Paul H. Wright and Karen K. Dixon, Highway Engineering, 7th Edition, Wiley Student Edition, 2009.

Outcome

- carry out surveys involved in planning and highway alignment
- Design the geometric elements of highways and expressways
- Carry out traffic studies and implement traffic regulation and control measures and intersection design
- Characterize pavement materials and
- Design flexible and rigid pavements as per IRC

PCC	(CENUGPC18)/(CE302)	Environmental Engineering	3L:0T:0P	3 credits
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Objective

To know various water systems, drinking water standards, water demand and its collections.
How to design a water treatment unit, a waste water treatment unit and its disposal.

Proposed Syllabus:

Water: -Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, Water demand industrial and agricultural water requirements; Various valves used in W/S systems. **Water Treatment:** Aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes **Air-**Composition and properties of air, Quantification of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Air quality standards. **Solid waste management-**Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Hazardous waste: Types and nature of hazardous waste as per the HW Schedules of regulating authorities. **Sewage-** Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.

Text/Reference Books:

- 1) Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
- 2) Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
- 3) Peavy, H.s, Rowe, D.R, Tchobanoglous, G. *Environmental Engineering*, Mc-Graw -Hill International Editions, New York 1985.
- 4) MetCalf and Eddy. *Wastewater Engineering, Treatment, Disposal and Reuse*, Tata McGraw-Hill, New Delhi.
- 5) Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
- 6) Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.
- 7) Sewage waste and Air pollution by S.K Garg.

Outcome

- After completion of course Students has the basic knowledge of drinking water standards and water supply network.
- They now can design water and waste water treatment units based upon the properties of water and waste water respectively.

PCC	(CENUGPC19)/ (CE304)	Foundation Engineering	3L:0T:0P	3 credits
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Objective

This course aims at providing students with knowledge on types and purposes of different foundation systems and structures. This course may lead them to have an exposure to the systematic methods for designing foundations. They will be able evaluate the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behaviour. Also they will have necessary theoretical background for design and construction of foundation systems.

Proposed Syllabus:

- ◆ Shear Strength - Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters. Unconfined compression test, vane shear test.
- ◆ Stress distribution, Newark's chart, Boussinesq's theory, pressure bulb.
- ◆ Foundations and their suitability; Foundation requirement and placement, types of foundations, choice of foundation; rigid and flexible footings; contact pressure. Evaluation of bearing capacity from plate load test, cone penetration, standard penetration test and other tests. Settlement of foundations; immediate and consolidation settlement; allowable settlement; differential settlement. Proportioning of footings for equal settlement in different types of soil. Combined footings; raft foundation; buoyant raft; analytical methods of design.
- ◆ Pile foundations; types of piles, pile capacity, static and dynamic formulae; design of piles groups; pile load test.

Text/Reference Books:

- 1) Principles of Foundation Engineering, by Braja M. Das, Cengage Learning
- 2) Essentials of Soil Mechanics and Foundations: Basic Geotechnics by David F. McCarthy
- 3) Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, and Gholamreza Mesri
- 4) Foundation Analysis and Design by Joseph E. Bowles
- 5) Pile Foundation Analysis and Design by H.G. Poulos and Davis.

Outcome

- ◆ Application of soil mechanics and other related techniques to design of foundation.
- ◆ Methods and site and soil exploration; bearing capacity and settlements; shallow and deep foundation; bracing and retaining structures.

PEC	(CENUGPE01)- (CE306)	PEC-I (Railway Engineering)	3L:0T:0P	3 credits
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Objective:

The Course will try to introduce the basic engineering principles that help in the planning, design, construction, operation and maintenance of Railways and Airports

Proposed Syllabus

Introduction to Railway Engineering, Gauges and Permanent Way, Wheel and Axles, Coning of Wheels, Track Resistances, Hauling Capacity, Track Modulus, Stresses in Track, Rails, Stresses in Components of Track, Creep in Rails, Wears & Failures in Rails, Jointed or Welded rails, Sleepers, Ballast, Fastenings, Geometric Design - Alignment of Track, Horizontal Curve & Super elevation, Speeds on Track, Transition Curve & Widening of Track, Vertical Curve & Gradients, Turnouts-Components, Crossing and Design of Turnout, Track Junctions and Designs, Signals ,Part-1, Signals Part-2, Train Control Systems, Interlocking of Track, High Speed Tracks.

Reference Book:

- Saxena S.P. & Arora S.P, A Textbook of Railway Engineering, Dhanpat Rai & Sons
- Agarwal M.M, Indian Railway Track, Sachdeva Press, 1991.

Outcome

Upon completion of this course, Students are expected to attain the following outcomes

- Can handle the design, construction, and operation of railroads and mass transit systems that use a fixed guide way.
- Tasks that include determining horizontal and vertical alignment design, station location and design, and construction cost estimating.

PEC	(CENUGPE02)/CE308	PEC-II (Surface Hydrology)	3L:0T:0P	3 credits
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Objective

1. To comprehend basic concepts of the water cycle and hydrology
2. To be able to perform engineering hydrology computations
3. To study occurrence movement and distribution of water resource
4. To know diverse methods of collecting the hydrological information, which is essential, to understand surface.

Proposed Syllabus:

Introduction: Hydrologic Cycle, history of Hydrology, applications in Engineering, Catchment: Physical Characteristics, Channel Characteristics, delineation of catchment boundary, Precipitation: Types, measurements and analysis, rain gauge network, error in estimation, missing data, consistency of rainfall records, measurement, DAD, IDF, PMP curves, Losses from Precipitation: Evaporation: factors affecting evaporation, saturation vapour pressure, humidity, estimation of evaporation- Meyer's formula and other empirical formula, Evapo-transpiration: Process affecting factors, estimation and measurement techniques-Balney Criddle formula. Infiltration: Process affecting factors, measurement and estimation, Infiltration Indices., Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, rainfall-runoff relationships, Hydrograph: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph

Text/Reference Books:

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3. K Subramanya, Water Resources Engineering through Objective Questions, Tata McGraw Hill.
4. G L Asawa, Irrigation Engineering, Wiley Eastern
5. L W Mays, Water Resources Engineering, Wiley.
6. J D Zimmerman, Irrigation, John Wiley & Sons
7. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

Outcome

1. Students would learn how to compute hydrologic mass balance in a closed basin.
2. Students would learn about procedures for analysis of various hydrometeorological and hydrological processes
3. Students can conduct frequency analysis on hydrologic data to determine return period or recurrence interval.
4. At the end of the course students can effectively communicate hydrologic concepts.
5. Students shall be able to learn how to collect hydrologic data and their analysis
6. Students can develop unit hydrographs based on streamflow data, and conduct basic unit hydrograph analysis.

PEC	(CENUGPE04)/(CE403)	(PEC-IV)Irrigation Engineering	3L:0T:0P	3 credits
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Objective:

1. To provide the students an overview about Irrigation Engineering
2. To provide an idea about planning and design of irrigation project,
3. To provide an idea about design and planning of lined and unlined canal
4. To impart knowledge about different hydraulic structure
5. To introduce an idea about design and planning of reservoir storage.

Proposed Syllabus

1. **Chapter 1:** Necessity of irrigation, Different Methods of Irrigation, surface irrigation- Basin irrigation: advantage, disadvantage, suitable crop, suitable soil, suitable slope, method of application of water, Border Irrigation-advantage, disadvantage, suitable crop, suitable soil, suitable slope, Furrow irrigation-advantage, disadvantage, suitable crop, suitable soil, suitable slope, Sprinkler irrigation-advantage, disadvantage, suitable crop, suitable soil, suitable slope, Drip irrigation-advantage, disadvantage, suitable crop, suitable soil, suitable slope; Selection of a particular method of irrigation; subsurface irrigation.
2. **Chapter 2:** Water requirements of crops: Soil-water plant relationship: Classification of soil water- soil moisture contents- depth of soil water available to plants, Base period, Duty Delta, Command area, intensity of irrigation, Irrigation efficiencies, permanent and ultimate wilting point. Depth of water applied during irrigation- Duty of water and delta, improvement of duty, command area and intensity of irrigation consumptive use of water and evapo-transpiration, irrigation efficiencies- assessment of irrigation water.
3. **Chapter 3:** Design of Irrigation Channel: Classification of Canals, canals in alluvium, design of canal in alluvial soil and non-alluvial soils- Kennedy's silt theory- Lacey's regime theory-Lacey's Regime diagrams- lining of irrigation channels- design of lined canal drainage behind lining, Economics of canal lining:
4. **Chapter 4:** Diversion head works: Types- selection of the suitable site for the diversion headwork components of diversion headwork- Causes of failure of structure on pervious foundation- Khosla's theory.
5. **Chapter 5:** Cross drainage works: Types- selection of suitable type of cross drainage work, aqueduct and Siphon aqueduct, determination of maximum flood discharge and waterway for drain, fluming of canal- uplift pressure on underside of barrel roof and at the floor of the culvert- design of bank connections
6. **Chapter 6:** Water storage-Flow mass curve, estimation of storage required for irrigation and other demands- Maintainable Demand

Reference Book:

1. A.M. Micheal, "Irrigation, Theory and Practice", Vikas Publishing House Pvt. Ltd. New Delhi
2. Garg, S.K., Irrigation Engineering and Hydraulic Structures, Khanna Publishers, New Delhi.

3. Modi, P.N., Irrigation Water Resources and Water Power Engineering, Standard Book House, New Delhi.
4. Punmia, B.C., and B.B. Pande, "Irrigation and Water Power Engineering", Laxmi Publication Pvt. Ltd., New Delhi
5. Sharma, R.K., Text book of Irrigation Engineering and Hydraulic Structures, Oxford and IBK Publishing House, New Delhi.
6. Sharma, S.K., Principles and Practice of Irrigation Engineering, S. Chand & Company Pvt. Ltd, New Delhi

Outcome

1. On completion of the course: Concepts of irrigation and to estimate the quantity of water to be supplied to field for irrigation.
2. At the end of the course students shall be able to plan and design irrigation projects.
3. On completion of the course students shall be able to design channels and other irrigation structures required for irrigation, drainage and other water-management projects

PCC	(CENUGPC24)/(CE402)	Construction Management	3L:0T:0P	3 credits
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Objective

Specifying project objectives and plans including delineation of scope, budgeting, scheduling, setting performance requirements, and selecting project participants

Proposed Syllabus:

Basics of Construction- Unique features of construction, construction projects types and features, phases of a project, agencies involved and their methods of execution; **Construction project planning-** Stages of project planning: Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; **Techniques of planning-** Bar charts, Gantt Charts. Networks: CPM networks: PERT- Assumptions underlying PERT analysis, determining three-time estimates. **Construction Methods basics:** Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods **Construction Equipment basics:** Conventional construction methods Vs. Mechanized methods and advantages of latter; Equipments for construction works. **Planning and organizing construction site and resources-** Site: site layout including enabling structures, developing site organization, Manpower, Materials **Project Monitoring & Control-** Supervision, record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control. **Contracts Management basics:** Importance of contracts; Types of Contracts, parties to a contract; Common contract clauses **Construction Costs:** Make-up of construction costs; Classification of costs, time cost trade-off in construction projects, compression and decompression.

Text/Reference Books:

- 1) Varghese, P.C., “*Building Construction*”, Prentice Hall India, 2007.
- 2) *National Building Code*, Bureau of Indian Standards, New Delhi, 2017.
- 3) Chudley, R., *Construction Technology*, ELBS Publishers, 2007.
- 4) Peurifoy, R.L. *Construction Planning, Methods and Equipment*, McGraw Hill, 2011
- 5) Nunnally, S.W. *Construction Methods and Management*, Prentice Hall, 2006
- 6) Jha, Kumar Neeraj., *Construction Project management, Theory & Practice*, Pearson Education India, 2015
- 7) Punmia, B.C., Khandelwal, K.K., *Project Planning with PERT and CPM*, Laxmi Publications, 2016.

Outcome

- An idea of how structures are built and projects are developed on the field
- An understanding of modern construction practices.
- A good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required and project economics.
- A basic ability to plan, control and monitor construction projects with respect to time and cost.
- An idea of how to optimise construction projects based on costs.
- An idea how construction projects are administered with respect to contract structures and issues.
- An ability to put forward ideas and understandings to others with effective communication processes