MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

CURRICULUM

AND

SCHEME OF EXAMINATION

(B.TECH IN CIVIL ENGINEERING)

BATCH: 2022-26

FOREWORD

This is to certify that this booklet contains the entire Curriculum and Scheme of Examination of B.Tech in Civil Engineering being offered at Faculty of Engineering and Technology of this University. This has been duly vetted and finally approved by the Academic Council of the University vide **37.14** held on **02.07.2021** respectively and changes, if any deemed appropriate, shall be duly incorporated after the necessary approval by the Academic Council.

This Curriculum and Scheme of Examination of B.Tech in Civil Engineering shall be implemented w.e.f. AY 2021-25.

Prof. (Dr.) Naresh Grover

Date: **Dean-Academics, MRIIRS**

Preamble

Civil Engineering includes analyzing, planning, designing and constructing buildings, infrastructure elements like Highways, bridges and Hydraulic structures. Additionally, the discipline involves protecting society and environmental health through sewage systems and water treatment facilities. The curriculum for B.Tech Civil Engineering has been benchmarked against the Model Curriculum by AICTE with training and education aligned to roll out highly-aware, sustainability-minded generation joining the workforce globally. The mandatory credits to earn the degree are 160 with core comprising of basic sciences and Civil Engineering specific subjects covering fundamentals.
Infrastructure in the cities are upgraded and managed by using Information and Communication Technologies (ICT) to make them sustainable in the long run as smart city needs smart governance and smart businesses. Smart buildings, zero energy buildings, smart water systems, and smart electricity grids, waste management protocols, will all be part of the future connected cities, in addition to mobility solutions. Environmental protection has to be at the forefront of the infrastructure design, this can be achieved by promotion of reuse and recycling of waste. Promotion of green technologies not only in water reuse and recycling and increasing availability of clean drinking water for everyone is to be enforced but application of same in all realms of Civil Engineering is to be incorporated in producing sustainable green design. As a result, engineering education must broaden to encompass infrastructure, environmental knowledge, technology, sensors, and data science.
B.Tech Civil Engg (Hons.) with specialization in Smart Cities and B.Tech Civil Engg(Hons.) with specialization in Green Technology and Sustainability Engineering within the sanctioned intake were introduced from batch 2021-25 onwards. These specializations have been adopted based on AICTE's Approval Process Handbook 21-22. It is stated that under Graduate Degree Courses in EMERGING / MULTIDISCIPLINARY AREAS shall be allowed as specialization from the same department. The minimum additional Credits for such Courses shall be in the range of 18-20 (including credit transferred from the SWAYAM platform) and the same shall be mentioned in the degree, as specialization in that particular area. So a student will earn minimum 180 credits to get Honours degree in these specializations. The additional 18-20 credits should be earned from the following courses included in the curriculum as core courses or Discipline/Multidisciplinary/Open Electives.
Besides "Engineering Graphics and Design" in 1st Semester, keeping up with the times, Computer Aided Analysis and Design courses start from 3rd semester onwards laying emphasis on National standards relating to technical drawings, Analysis and also to develop Parametric Structural design. Typical softwares used in Civil Engineering like STAAD, ETABS and Primavera are included as part of courses like "Structural Engineering" and "Construction Engineering & Management".

There are ample opportunities available to students to opt both for discipline electives and cross discipline electives/MOOCs floated at the University level. The Discipline elective baskets contain courses from all streams of Civil Engineering viz. Structural Engineering, Geotechnical Engineering, Environmental Engineering, Water Resources and Transportation Engineering along with advanced subjects like "Prestressed Concrete", correlated courses like "Environmental Geo-technology", "Energy Science and Engineering" , "Environmental Impact Assessment and Life Cycle Analyses", "Engineering Materials for Sustainability" and "Sustainable Construction Methods" to explore sustainable options aligned towards UN Sustainable Development Goals (SDGs). The sustainability agenda has been given impetus to inculcate a sense of social responsibility amongst the budding Civil Engineers.

The Curriculum has been further adapted and designed according to the regional requirements of Faridabad. Smart Cities focus provides one with just that, guiding one through a customized curriculum, hands on training and interactive industrial experiences outside of the classroom. Corresponding Census housing data and is oriented towards smart city development through courses like "Masonry Structures" and "Urban Transportation Planning", "Intelligent Transportation Systems", "Solid and Hazardous Waste Management", "Airport Planning and Design" and "Geographic Information Systems and Science".

Faridabad is located in Zone IV and thus is prone to earthquakes and its eastern boundary is prone to floods. This vulnerability has been taken into account and subjects like "Disaster Preparedness and Planning", "Disaster management", "Earthquake Engineering", "Repairs & Rehabilitation of Structures" have been included in the curriculum.

Impetus on innovation and research starts from 3^{rd} semester onwards to 4^{th} and 5^{th} semester through courses "Design, Thinking and Innovation-I", II and III. The students are required to identify societal, regional issues, conduct literature survey, devise methodologies for solutions and ultimately publish research papers and thus, add to the knowledge of existing literature in varying fields. Industrial Training has been kept before 3^{rd}, 5^{th} and 7^{th} semesters for the students to understand Industry requirements and have hands-on experience. The project work starts from 6^{th} Semester as Phase I and then in 7^{th} Semester for implementation of recognized contemporary civil engineering problems. The research publications, project work and industrial experience greatly enhance the employability, problem solving skills with lifelong lesson enrichment after due deliberations.

"Civil Engineering Societal and Global Impact" teach the students professional relations, civic responsibilities, and ethical obligations for engineering practice. Roles of all stakeholders in the process-owners, developers, designers, consultants, architects, contractors, and suppliers are stressed upon through these courses. Courses based on Quantitative Aptitude and Personality Development in the curriculum equip the students with communication skills, and get them acquainted with the culture of institution and human values. Foreign language courses are introduced in 5^{th} semester and 6^{th} semester to increase their employability options abroad. Mandatory Courses on Constitution of India and Environmental science have been included to increase the general awareness as responsible citizens.

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FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

VISION AND MISSION OF THE DEPARTMENT

VISION

To produce highly competent Civil Engineers of International standards for catering to local, national and global needs and to provide state-of-the-art consultancy, research and development in various fields of Civil Engineering.

MISSION

M_1 To provide a rigorous hands-on engineering education integrated in a student-centered environment to equip them with life-long learning skills necessary for professional practice.

M_2 To prepare our students to be the technical, business and global leaders of tomorrow by inculcating team work and communication skills.

M_3 To promote research, development and consultancy through constant interaction with industry and research organizations.

M_4 To inculcate ethical values and professionalism.

ABOUT THE DEPARTMENT

The Civil Engineering department was established in the year 2009. Initially the department offered only UG program along with a diploma integrated program in Civil Engineering. The PG was started from 2012 onwards with specialization in Structural Engineering. The department added two more PG programs of Construction Management and Transportation Engineering in 2015 and 2016 respectively. The department boasts of an alumni base of over 1000+ students well placed in various companies of national and international repute.

Presently department offers following programs:

- B.Tech(Civil Engineering)
- B.Tech Civil Engg (Hons.) with specialization in Smart Cities
- B.Tech Civil Engg(Hons.) with specialization in Green Technology and Sustainability Engineering
- M.Tech (Civil Engineering with specialization in Structural Engineering/Construction Management/Transportation Engineering), 2 year full time
- M.Tech (Civil Engineering with specialization in Structural Engineering/Construction Management/Transportation Engineering), 3 year part time
- PhD (Civil Engineering)

The offered programs follow the CBCS and the model curriculum floated by AICTE. Further, the course curriculums have been specially tailored to fulfill the growing global outlook and focuses on upcoming technologies in the field of Civil Engineering, to cater to the needs of the industry and R&D organizations.

A blend of highly qualified and experienced faculty members from length and breadth of country, having M.Tech/Ph.D. degree from IIT, NIT, DTU, JMI and other Institutes of National reputes. Faculty members of Civil Engineering Department have 100+ papers published in various national & international journals of repute.

The Department has fully equipped Labs with state-of-the-art equipment. Structure Lab, Soil Mechanics Lab, Transportation Engineering lab, Concrete Technology lab, Survey Lab, CADD & STADD PRO lab, Fluid

Mechanics Lab, Environmental Engineering Lab, Engineering Geology Lab. A departmental library, IT facilities and adequate research infrastructure helps the students to pursue research and innovation.

The department bridges industry academia interface through regular site visits, expert talks, workshops, and training programs as well as faculty development programs. Students are also encouraged to engage in extracurricular and co-curricular activities, essential for overall development, nurturing of team spirit and developing organizational skills to keep themselves abreast with current developments in the area of Civil Engineering.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Department of Civil Engineering keeping in view interests of all their stakeholders have formulated the Program Educational Objectives (PEO's) that are comprehensive statements describing the career and professional accomplishments that the program is preparing the learner for.

PEO's of B.Tech Program in Civil Engineering are:

PEO 1: To prepare learners with a solid foundation in mathematics, sciences, and technical skills needed to analyze and design civil engineering problems.

PEO 2: To prepare learners for meaningful work by applying their strong Civil Engineering business, leadership, and communication skills to meet the expectations of their employers.

PEO 3: To prepare learners to apply knowledge, strong reasoning, and quantitative skills to design and implement creative and sustainable solutions.

PEO 4: To prepare learners to effectively use modern equipments & programming tools to solve real life problems that are technically sound, economically feasible and socially acceptable.

PEO 5: To prepare learners for successful professional career, to excel in higher studies and or to become entrepreneur.

PEO 6: To prepare learners to become responsible citizens by serving the community locally, nationally, and internationally.

"Mission of the Department-PEO Matrix"

PEO Statements		Mission 1	Mission 2	Mission 3	Mission 4
PEO 1:	To prepare learners with a solid foundation in mathematics, sciences, and technical skills needed to analyze and design civil engineering problems.	**3**	**2**	**3**	**1**
PEO 2:	To prepare learners for meaningful work by applying their strong Civil Engineering business,leadership, and communication skills to meet the expectations of their employers.	**3**	**3**	**2**	**2**
PEO 3:	To prepare learners to apply knowledge, strong reasoning, and quantitative skills to design and implement creative and sustainable solutions.	**3**	**3**	**3**	**2**
PEO 4:	To prepare learners to effectively use modern equipments & programming tools to solve real life problems that are technically sound, economically feasible and socially acceptable.	**3**	**3**	**3**	**2**

PEO 5:	To prepare learners for successful professional career, to excel in higher studies and or to become entrepreneur.	**3**	**3**	**3**	**3**
PEO 6:	To prepare learners to become responsible citizens by serving the community locally, nationally, and internationally.	**3**	**3**	**3**	**3**

PROGRAM OUTCOMES (POs)

a. Apply the knowledge of mathematics, science, engineering fundamentals, and Engineering specialization to the solution of complex engineering problems.
b. Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.
c. Design solutions for complex engineering problems and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.
d. Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
f. Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
h. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i. Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
j. Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.
k. Demonstrate knowledge and understanding of engineering and management principles and apply these to one’s own work, as a member and leader in a team. Manage projects in multidisciplinary environments.
l. Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

m. An ability to identify, analyze and design civil engineering problems and use of relevant codal provisions
n. An ability to pursue research, higher studies, consultancy and face competitive examinations that offers challenging and rewarding careers in civil engineering

Mapping of PEOs, POs & PSOs

PEOs \ POs/PSOs	a	B	c	d	e	f	g	h	i	j	k	L	m	n
PEO 1	3	3	2	2	1	1	1	-	-	-	-	1	1	2
PEO 2	-	-	1	-	1	1	2	3	3	3	3	1	1	2
PEO 3	3	3	3	2	2	1	1	-	-	-	-	1	3	3
PEO 4	-	-	1	1	1	2	2	2	-	2	-	3	3	3
PEO 5	1	1	2	3	3	2	2	-	-	-	-	2	-	3
PEO 6	1	1	2	3	3	2	2	3	-	-	2	2	3	-

SEMESTER SYSTEM AND CHOICE BASED CREDIT SYSTEM

Credit based system of study and student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grade obtained by the student, grade point average is calculated

(a) Course credits assignment

Each course has a certain number of credits assigned to it depending upon its duration in periods for lecture, tutorial and laboratory/clinical practice in a week. A few courses/activities are without credit (s) and are referred to as Audit Pass Courses (APC) but are mandatory to pass as a partial fulfillment of award of degree.

(b) Earning of credits

At the end of every course, a letter "Grade" shall be awarded in each course for which a student has registered. On obtaining a minimum Pass Grade, student shall accumulate the course credits as Earned Credits. A student's performance shall be measured by the number of credits that he/she has earned and by the weighted grade point average. Grades obtained in the audit courses shall not be counted for computation of grade point average, however shall be mandatory to pass as a partial fulfillment of award of degree.

For Award of Degree of a programme **B. Tech (Civil Engineering)**, he/she has to earn minimum **160 credits** during the **4 year duration** of the programme **in 8 semesters**.
The total credits required to be earned have been further classified under two baskets of courses: "Compulsory Courses Basket", and "Elective Courses Basket". The **total 130 credits required** to be earned under "Compulsory Courses Basket" and minimum **30 credits** under "Elective Courses Basket".
The minimum additional Credits for B.Tech Civil Engg (Hons.) with specialization in Smart Cities and B.Tech Civil Engg(Hons.) with specialization in Green Technology and Sustainability Engineering shall be in the range of 18-20 (including credit transferred from the SWAYAM platform) and the same shall be mentioned in the degree, as specialization in that particular area. So a student will earn minimum 180 credits to get Honours degree in these specializations.
The additional 18-20 credits should be earned from the courses included in the curriculum as core courses or Discipline/Multidisciplinary/Open Electives mentioned under the specializations.

All courses under "Compulsory Courses Basket", are required to be qualified and cleared/pass by each and every student enrolled under the programme and are semester-wise listed in the study scheme along with credits assigned to each course.

Under Elective Courses Basket, there will be three types of courses:

- Semester-wise courses offered by the department itself
- Open/Inter-disciplinary courses offered at the Institute/University level notified from the office of Dean-Academics.
- Massive Open Online Courses (MOOCs) available on SWAYAM Platform or any other platform as recommended by UGC/AICTE and notified from the office of Dean-Academics.

Each course shall have credits assigned to it. Student shall be required to register courses every semester for as many courses/credits specified under "Elective Courses Basket" depending upon his/her interest, capability/pace of learning and availability of time slot (without any clash in time table) so as to earn all required total credits under the "Elective Courses Basket" during the entire programme duration.

However, for registration of courses [including courses under "Compulsory Courses Basket", "Elective Courses Basket" and Previous Semester Courses (wherein he/she was declared in-eligible on the basis of attendance or he/she could not clear the course within permissible given chances)], if any, the maximum limit in a semester shall be 30 credits.

Programme: B.Tech (Civil Engineering)						
Study Scheme at a Glance (2022-26)						
Compulsory Courses					**Elective Courses**	
Type of Courses						
Fundamental	**Core**	**Ability Enhancement Courses (AEC)**	**Skill Enhancement Courses (SEC)**	**HSMC**	**Open Electives**	**Domain Specific Elective Courses**
Sem1	**Sem1**	**Sem1**	**Sem1**	**Sem1**	**Sem1**	**Sem1**
Chemistry		English	Workshop/Manufacrturing Practices	EVS	Student may choose courses from open elective basket	
Mathematics- 1			AI for Engineering			
Programming for Problem Solving						
Chemistry lab						
Programming for Problem Solving lab						
Sem 2	**Sem 2**	**Sem 2**	**Sem 2**	**Sem 2**	**Sem 2**	**Sem2**
Physics for Engineers	Engg Graphics & Design	English Lab	Biology for Engineers	Constitution of India	Student may choose courses from open elective basket	

Mathematics- 2						
Basic Electrical Engineering						………
Physics lab						
Basic Electrical Engg lab						
Sem3	**Sem3**	**Sem3**	**Sem3**	**Sem3**	**Sem3**	**Sem3**
Mathematics-3 (Transform & Discrete Mathematics)	Engineering Mechanics for Civil Engineers	Quantitative Aptitude	Summer Internship-I	Universal Human Values	Student may choose courses from open elective basket	
Basic Electronics	Disaster Preparedness & Planning		Design, Thinking and Inoovation-I	Sports and Yoga		
Material Science	Engineering Geology					
	Surveying and Geomatics					
	Computer-aided Civil Engineering Drawing Lab					
	Engineering Geology Lab					
	Surveying & Geomatics Lab					

*Training undertaken by students during the Summer vacation after second Semester(4 weeks minimum) will be evaluated as a III Semester subject.						
Sem4	**Sem4**	**Sem4**	**Sem4**	**Sem4**	**Sem4**	**Sem4**
Energy Science & Engineering	Introduction to Fluid Mechanics	QAPD-I	Design, Thinking and Innovation -II		Student may choose courses from open elective basket	Smart Materials
Building Construction	Introduction to Solid Mechanics					Introduction to Sustainable development
	Materials, Testing & Evaluation					Transformation to Green Buildings
	Transportation Engineering					Introduction to Smart Cities
	Introduction to Fluid Mechanics Lab					
	Solid Mechanics Lab					
	Materials, Testing & Evaluation Lab					
	Transportation Engineering Lab					
Sem5	**Sem5**	**Sem5**	**Sem5**	**Sem5**	**Sem5**	**Sem5**
	Environmental Engineering - I	QAPD-II	Summer Internship-II		Student may choose courses from open elective basket	Hydraulic Engineering

	Geotechnical Engineering	French-I	Design, Thinking and Innovation-III			Pavement Materials
	Structural Engineering	German -I				Design of hydraulic structures
	Environmental Engineering Lab	Spanish-I				Engineering Materials for Sustainability
	Geotechnical Engineering Lab					Green and Renewable Energy
	Structural Analysis-I					Sustainable Architecture
	Concrete Technology					Planning and Design of Sustainable Transport Systems
	Structural Engineering Lab					
*Training undertaken by students during the Summer vacation after fourth Semester(4-6 weeks) will be evaluated as a V Semester subject.						
Sem6	**Sem6**	**Sem6**	**Sem6**	Sem6	Sem6	Sem6
	Estimation & Costing and Valuation	QAPD-III	Project Phase-I		Student may choose courses from open elective basket	Traffic Engineering and Management
	Environmental Engineering - II	French-II				Geotechnical Design
	Hydrology & Water Resources Engineering	German -II				Construction Project Planning & Systems
	Construction Engineering & Management	Spanish-II				Environmental Systems
	Design of Concrete Structures	Entrepreneurship and Startups				Open Channel flow
						Railway Engineering

						Design of Steel Structures
						Soil Mechanics
						Prefabricated Structures
						Building Information Modelling
Sem7	**Sem7**	**Sem7**	**Sem7**	**Sem7**	**Sem7**	Masonry Structures
	Structural Analysis-II	**General Proficiency**	Project Phase-II		Student may choose courses from open elective basket	Highway Construction and Management
	Foundation Engineering		**Summer Internship-III**			Urban Transportation Planning.
						Environmental Laws and Policy
						Physico-Chemical Processes for Water and Wastewater Treatment
						Engineering Risk & Uncertainty
						Bridge Engineering
						Disaster Risk Reduction
						Advanced Design of Concrete Structures
						Metro Systems & Engineering (BCE-DS-731)
						Construction Safety

Sem8	Sem8	Sem8	Sem8	Sem8	Sem8	
			Summer Internship-IV			Airport Planning and Design
						Construction Equipment& Automation
						Air, Noise Pollution and Control
						Environmental Geo-technology
						Intelligent Transportation Systems
						Port and Harbour Engineering
						Construction Productivity
						Sustainable Construction Methods
						Solid and Hazardous Waste Management
						Prestressed Concrete
						Repairs & Rehabilitation of Structures
						Environmental Impact Assessment and Life Cycle Analyses
						Earthquake Engineering
						Geographic Information Systems and Science
						Fire Resistant construction
						Heritage Conservation
						Water Auditing

In addition to above Domain Specific Electives, Interdisciplinary, Generic, on-line courses (MOOCs) to be offered, shall be notified by the Academic Branch of the University well before start of Semester / Academic Session.

Minimium credits required through compulsory courses: 130
Minimium credits required through Elective courses: 30

$The LTP distribution, Evaluation Scheme and pre-requisite(s) for Elective courses are given. The course code will depend upon the elective(s) chosen by the student. In addition to above Domain Specific electives, Interdisciplinary, Generic, on-line courses (MOOCs) to be offered, shall be notified by the Academic Branch of the University well before start of Semester / Academic Session.

@The weekly load will depend upon the electives chosen by the student.

Additional Notes

Note 1

A candidate would need to earn a minimum of 160 credits (compulsory courses + elective courses) for the award of UG degree (B.Tech) in Civil Engineering.

There shall be a requirement to earn extra 20 credits (Total 180 credits) for Honours degree in Civil Engineering with specialisation in Smart Cities/Green Technology and Sustainability Engineering in accordance with AICTE norms.

Note 2

Project Phase-I will be the initial phase of the B.Tech Project that is extended to 7th semester as Project Phase-II. Also it can be extended experimental work of the research undertaken in DTI-I, DTI-II and DTI-III.

Project Phase-II can be the any one of the following:
(i) an independent project
(ii) an industrial project in any industry of his/her choice, following which the student has to undergo Summer Internship-III in the same industry.

Study Scheme 2022-26

Manav Rachna International Institute of Research and Studies

Faculty of Engineering and Technology

Department of Civil Engineering

B.TECH(Civil Engineering)/
B.TECH(Civil Engineering with specialisation in Green Technology and Sustainability Engineering)/
B.TECH(Civil Engineering with specialisation in Smart Cities)
2022-26 BATCH

SEMESTER-I

Course Type	Course Code	Title of Course	Pre-requisite Course, if any		Periods/Week				Marks			Duration of Exam	Credits
			Title	Code	L	T	P	Total	Int./ Continuous	End Sem.	Total		
BSC	BPH-106	Physics for Engineers (Group A)	None		3+1#	0	0	4	100	100	200	3 hrs	3
BSC	BCH-106	Chemistry for Engineers (Group B)	None		2+1 #	0	0	3					2
BSC	BMA-101/ BMA-102/ BMA-103	Mathematics-I(For CSE only)/ Mathematics- 1(All Branches except CSE & BT)/ Mathematics for Biotechnology-I (For BT only)	None		3+1#	1	0	5	100	100	200	3 hrs	4
ESC	BEE-101	Basic Electrical Engineering (Group A)	None		3	0	0	3	100	100	200	3 hrs	3
ESC	BCS-101	Programming for Problem Solving(Group B)	None		3	0	0	3	100	100	200	3 hrs	3
ESC	BCS-100A	AI For Engineering	None		2	0	0	2	100	100	200	3 hrs	2
ESC	BME-101A/ BME-102	Engg Graphics & Design(Group A)/ Workshop/Manufacturing Practices(Group B)	None		0	0	4	4	100	100	200	3 hrs	2
BSC	BPH-151A/ BCH-151A	Physics lab (Group A)/ Chemistry lab (Group B)	None		0	0	2	2	50	50	100	2 hrs	1
ESC	BEE-151A/ BCS-151	Basic Electrical Engg lab(Gp A)/ Programming for Problem Solving lab (Group B)	None		0	0	2	2	50	50	100	2 hrs	1
HSMC	BHM-201	English	None		2	0	0	2	50	50	100	2 hrs	2
HSMC	BHM-MC-001/ BCH-MC-002	Constitution of India* (Group A)/ EVS** (Group B)	None		1*	1**	0	1	50	50	100	2 hrs	AP
		Total (Group A/ Group B)											**18/17**

 # Contact hours per week have been increased due to bridge course.

SEMESTER-II

Course Type	Course Code	Title of Course	Pre-requisite Course, if any		Periods/Week				Marks			Duration of Exam	Credits
			Title	Code	L	T	P	Total	Int./ Continuous	End Sem.	Total		
BSC	BPH-106	Physics for Engineers (Group B)	None		3+1#	0	0	4					3
BSC	BCH-106	Chemistry (Group A)	None		2+1 #	0	0	3	100	100	200	3 hrs	2
BSC	BMA-201/ BMA-202/ BMA-203	Mathematics-2(For CSE only) /Mathematics- 2(All Branches except CSE & BT)/Mathematics for Biotechnology-II (For BT only)	None		3	1	0	4	100	100	200	3 hrs	4
ESC	BEE-101	Basic Electrical Engineering (Group B)	None										
ESC	BCS-101	Programming for Problem Solving (Group A)	None		3	0	0	3	100	100	200	3 hrs	3
ESC	BME-101A/ BME-102	Engg Graphics & Design(Group B)/ Workshop/Manufacturing Practices(Group A)	None		0	0	4	4	100	100	200	3 hrs	2
BSC	BBT-100	Biology for Engineers	None		2	0	0	2	100	100	200	3 hrs	2
BSC	BCH-151A/ BPH-151A	Chemistry lab (Group A)/ Physics lab (Group B)	None		0	0	2	2	50	50	100	2 hrs	1
ESC	BCS-151 /BEE-151A	Programming for Problem Solving lab (Group A)/ Basic Electrical Engg lab(Group B)	None		0	0	2	2	50	50	100	2 hrs	1
HSMC	BHM-151	English lab	None		0	0	2	2	50	50	100	2 hrs	1
HSMC	BCH-MC-002/BHM-MC-001	EVS** (Group A)/Constitution of India* (Group B)	None		1*	1**	0	1	50	50	100	2 hrs	AP
		Total (Group A/ Group B)											**16/17**

 # NOTE: Contact hours per week have been increased due to bridge course.

Open Elective Courses shall also be offered, which shall be notified well before start of the semester. The student shall be required and allowed to opt the courses out of offered courses as per prescribed limit for maximum credits(28) in a semester and for the category of Elective Courses under University Rules.

SEMESTER III

Course Type	Course Code	Title of Course	Pre-requisite Course, if any		Periods/Week				Marks			Duration of Exam	Credits
			Title	Code	L	T	P	Total	Int./ Cont. Evaluation	End Semester Exam	Total		

Compulsory Subjects													
PROJ	**Proj-CE-300A**	**Summer Internship-I**	None		**2 Weeks**				**50**		**50**		**1**
CORE	BCE-DS-302A	Engineering Mechanics for Civil Engineers	None		2	1	0	3	100	100	200	3 hours	3
CORE	BCE-DS-303	Disaster Preparedness & Planning	None		2	0	0	2	100	100	200	3 hours	2
CORE	BCE-DS-305	Engineering Geology	None		1	0	0	1	100	100	200	3 hours	1
ESC	BEC-DS-312/BCE-DS-306	Basic Electronics/Material Science	None		1	0	0	1	100	100	200	3 hours	1
CORE	BCE-DS-403	Surveying & Geomatics	None		2	1	0	3	100	100	200	3 hours	3
CORE	BCE-DS-351A	Computer-aided Civil Engineering Drawing Lab	None		0	0	4	4	100	100	200	2 hours	2
CORE	BCE-DS-352	Engineering Geology Lab	None		0	0	2	2	50	50	100	2 hours	1
CORE	BCE-DS-453	Surveying & Geomatics Lab	None		0	0	2	2	50	50	100	2 hours	1
PROJ	DTI-300	Design, Thinking and Innovation-I	None		0	1	0	1	50	0	50		1
HSMC	BHM-MC-004	Quantitative Aptitude	None		0	0	2	2	50	50	100	2 hours	AP
HSMC	BHM-320	Universal Human Values	None		1	1	0	2	50	50	100	2 hours	2
HSMC	BHM-MC-002	Sports and Yoga	None		2	0	0	2	100	0	100	1 hour	AP
		TOTAL			**11**	**4**	**10**	25	**1000**	**800**	**1800**		**18**

*Refer to the aforementioned list of choice-based course-basket offered at the Department level. Further, under the elective courses, besides the Interdisciplinary/ Generic papers, on-line courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester at University. Student shall be required and allowed to opt for such offered courses as per limit of maximum credits and for the category of elective courses as per the University Rules.

SEMESTER IV													
Course Type	**Course Code**	**Title of Course**	**Pre-requisite Course, if any**		**Periods/Week**				**Marks**			**Duration of Exam**	**Credits**
			Title	**Code**	**L**	**T**	**P**	**Total**	**Int./ Cont. Evaluation**	**End Semester Exam**	**Total**		
Compulsory Courses													

CORE	BCE-DS-401	Introduction to Fluid Mechanics	Engineering Mechanics	BCE-DS-302	2	0	0	2	100	100	200	3 hours	2
CORE	BCE-DS-402	Introduction to Solid Mechanics	Engineering Mechanics	BCE-DS-302	2	0	0	2	100	100	200	3 hours	2
CORE	BCE-DS-404A	Materials, Testing & Evaluation	None		1	1	0	2	100	100	200	3 hours	2
ESC	BCE-DS-405/BCE-DS-407	Energy Science & Engineering/Building Construction	None		1	1	0	2	100	100	200	3 hours	2
CORE	BCE-DS-406	Transportation Engineering	None		3	0	0	3	100	100	200	3 hours	3
CORE	BCE-DS-451	Introduction to Fluid Mechanics Lab	None		0	0	2	2	50	50	100	2 hours	1
CORE	BCE-DS-452	Solid Mechanics Lab	None		0	0	2	2	50	50	100	2 hours	1
CORE	BCE-DS-454	Materials, Testing & Evaluation Lab	None		0	0	2	2	50	50	100	2 hours	1
CORE	BCE-DS-455	Transportation Engineering Lab	None		0	0	2	2	50	50	100	2 hours	1
PROJ	DTI-400	Design, Thinking and Innovation-II	None		0	1	0	1	50		50		1
HSMC	BHM-MC-006	QAPD-I	None		0	0	2	2	50	50	100	2 hours	AP
	TOTAL				**9**	**3**	**10**	22	**800**	**750**	**1550**		**16**
*Refer to the aforementioned list of choice-based course-basket offered at the Department level, further, under the elective courses, besides the Program/Interdisciplinary/ Open/Generic papers, on-line courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester at University. Student shall be required and allowed to opt for such offered courses as per limit of maximum credits and for the category of elective courses as per the University Rules.													
Note:A student may register for courses leading to a minimum of 16 credits and a maximum of 28 credits.													
Discipline Elective Courses*													
Domain Specific	BCE-DS-421	Smart Materials	None		3	0	0	3	100	100	200	3 hours	3
Domain Specific	BCE-DS-422	Introduction to Sustainable development	None		3	0	0	3	100	100	200	3 hours	3
Domain Specific	BCE-DS-423	Transformation to Green Buildings	None		3	0	0	3	100	100	200	3 hours	3
Domain Specific	BCE-DS-424	Introduction to Smart Cities	None		3	0	0	3	100	100	200	3 hours	3
SEMESTER V													

Course Type	Course Code	Title of Course	Pre-requisite Course, if any		Periods/Week				Marks			Duration of Exam	Credits
			Title	Code	L	T	P	Total	Int./ Cont. Evaluation	End Semester Exam	Total		
Compulsory Courses													
PROJ	**Proj-CE-500**	**Summer Internship-II**	None	**4-6 weeks**					**100**		**100**		**2**
CORE	BCE-DS-502	Geotechnical Engineering	None		2	0	0	2	100	100	200	3 hours	2
CORE	BCE-DS-503A	Structural Engineering	Engineering Mechanics for Civil Engineers	BCE-DS-302	1	1	0	2	100	100	200	3 hours	2
CORE	BCE-DS-505A	Structural Analysis-I	None		1	0	2	3	100	100	200	3 hrs	2
CORE	BCE-DS-506A	Concrete Technology	None		2	0	0	2	100	100	200	3 hours	2
CORE	BCE-DS-507	Environmental Engineering - I	None		2	0	0	2	100	100	200	3 hours	2
CORE	BCE-DS-552	Geotechnical Engineering Lab	None		0	0	2	2	50	50	100	2 hours	1
CORE	BCE-DS-553	Structural Engineering Lab			0	0	2	2	50	50	100	2 hours	1
CORE	BCE-DS-652	Environmental Engineering Lab			0	0	2	2	50	50	100	2 hours	1
CORE	DTI-500	Design, Thinking and Innovation-III	None		0	2	0	2	50	0	50	2 hours	2
HSMC	BHM-MC-008	QAPD-II	None		0	0	2	2	50	50	100	2 hours	AP
Total					**8**	**3**	**10**	21	**850**	**700**	**1550**		**17**
Discipline Elective Courses*													
Domain Specific	BCE-DS-501	Hydraulic Engineering	Introduction to Fluid Mechanics	BCE-DS-401	3	0	0	3	100	100	200	3 hours	3
Domain Specific	BCE-DS-521	Pavement Materials	Transportation Engineering	BCE-DS-406	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-522	Design of hydraulic structures	Introduction to Fluid Mechanics	BCE-DS-401	3	0	0	3	100	100	200	3 hrs	3

Domain Specific	BCE-DS-523	Engineering Materials for Sustainability	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-524	Green and Renewable Energy	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-525	Sustainable Architecture	None		2	0	2	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-526	Planning and Design of Sustainable Transport Systems	None		3	0	0	3	100	100	200	3 hrs	3
Generic Elective-I	HM-506	French- I	None		2	0	0	2	50	50	100	1.5 hrs	2
Generic Elective-I	HM-507	German-I	None		2	0	0	2	50	50	100	1.5 hrs	2
Generic Elective-I	HM-508	Spanish-I	None		2	0	0	2	50	50	100	1.5 hrs	2

$The LTP distribution, Evaluation Scheme and pre-requisite(s) for Elective courses are given above. The course code will depend upon the elective(s) chosen by the student.

@The weekly load will depend upon the electives chosen by the student .

*Refer to the aforementioned list of choice-based course-basket offered at the Department level. Further, under the elective courses, besides the Interdisciplinary/ Generic papers, on-line courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester at University. Student shall be required and allowed to opt for such offered courses as per limit of maximum credits and for the category of elective courses as per the University Rules.

Note:A student may register for courses leading to a minimum of 18 credits and a maximum of 28 credits.

SEMESTER VI

Course Type	Course Code	Title of Course	Pre-requisite Course, if any		Periods/Week				Marks			Duration of Exam	Credits
			Title	Code	L	T	P	Total	Int./ Cont. Evaluation	End Semester Exam	Total		
Compulsory Courses													
PROJ	**PROJ-CE-600A**	**Project Phase-I**	None		**0**	**0**	**2**	**2**	**100**	**-**	**100**	**2 hrs**	**1**
CORE	BCE-DS-601A	Estimation & Costing and Valuation	None		1	0	2	**3**	100	100	200	3 hours	2
CORE	BCE-DS-603	Hydrology & Water Resources Engineering	None		2	1	0	**3**	100	100	200	3 hours	3
CORE	BCE-DS-604A	Construction Engineering & Management	None		2	0	2	**4**	100	100	200	3 hours	3
CORE	BCE-DS-605A	Design of Concrete Structures	None		2	0	2	**4**	100	100	200	3 hours	3

CORE	BCE-DS-606	Environmental Engineering - II	None		2	0	0	**2**	100	100	200	3 hours	2
HSMC	BHM-MC-009	QAPD-III	None		0	0	2	**2**	50	50	100	2 hours	AP
HSMC	BHM-520	Entrepreneurship and Startups	None		2	0	0	**2**	100	100	200	3 hours	2
	TOTAL				**11**	**1**	**10**	**22**	**750**	**650**	**1400**		**16**
Discipline Elective Courses*													
Domain Specific	BCE-DS-621A	Traffic Engineering and Management	Transportation Engineering	BCE-DS-406	2	0	2	4	100	100	200	3 hrs	3
Domain Specific	BCE-DS-622	Geotechnical Design	Geotechnical Engineering	BCE-DS-502	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-623A	Construction Project Planning & Systems	None		2	0	2	4	100	100	200	3 hrs	3
Domain Specific	BCE-DS-624	Environmental Systems	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-625	Open Channel flow	Introduction to Fluid Mechanics	BCE-DS-401	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-626	Railway Engineering	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-627A	Design of Steel Structures	Engineering Mechanics for Civil Engineers	BCE-DS-302	2	0	2	4	100	100	200	3 hrs	3
Domain Specific	BCE-DS-628	Soil Mechanics	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-629	Prefabricated Structures	Design of Concrete Structures	BCE-DS-605	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-630	Building Information Modelling	None		3	0	0	3	100	100	200	3 hrs	3
Generic Elective-II	HM-606	French- II	French- I	HM-506	2	0	0	2	50	50	100	1.5 hrs	2
Generic Elective-II	HM-607	German-II	German-I	HM-507	2	0	0	2	50	50	100	1.5 hrs	2
Generic Elective-II	HM-608	Spanish-II	Spanish-I	HM-508	2	0	0	2	50	50	100	1.5 hrs	2
$The LTP distribution, Evaluation Scheme and pre-requisite(s) for Elective courses are given above. The course code will depend upon the elective(s) chosen by the student.													
@The weekly load will depend upon the electives chosen by the student .													
Note:A student may register for courses leading to a minimum of 16 credits and a maximum of 28 credits.													

*Refer to the aforementioned list of choice-based course-basket offered at the Department level. Further, under the elective courses, besides the Interdisciplinary/ Generic papers, on-line courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester at University. Student shall be required and allowed to opt for such offered courses as per limit of maximum credits and for the category of elective courses as per the University Rules.

SEMESTER VII

Course Type	Course Code	Title of Course	Pre-requisite Course, if any		Periods/Week				Marks			Duration of Exam	Credits
			Title	Code	L	T	P	Total	Int./ Cont. Evaluation	End Semester Exam	Total		
Compulsory Courses													
PROJ	**Proj-CE-710**	**Summer Internship-III**	None	**4-6 weeks**					**100**		**100**		**2**
PROJ	**Proj-CE-700A**	**Project Phase-II**	Project Phase-I	Proj-CE-600	**0**	**0**	**8**	**8**	**200**	**100**	**300**	**2 hrs**	**5**
Core	**GP-CE-700**	**General Proficiency**											**AP**
Core	BCE-DS-702A	Structural Analysis-II	None		2	0	2	**4**	100	100	200	3 hrs	3
Core	BCE-DS-703A	Foundation Engineering	None		2	0	2	**4**	100	100	200	3 hrs	3
DE/OE/GE	$	Electives	None					**0**					
TOTAL					**4**	**0**	**12**	**16**	**400**	**300**	**700**		**13**
Discipline Elective Courses*													
Domain Specific	BCE-DS-721	Masonry Structures	Materials, Testing & Evaluation	BCE-DS-404	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-722A	Highway Construction and Management	Transportation Engineering	BCE-DS-406	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-723	Urban Transportation Planning.	Transportation Engineering	BCE-DS-406	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-724	Environmental Laws and Policy	Environmental Engineering	BCE-DS-602	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-725	Physico-Chemical Processes for Water and Wastewater Treatment	Environmental Engineering	BCE-DS-602	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-726	Engineering Risk & Uncertainty	None		3	0	0	3	100	100	200	3 hrs	3

Domain Specific	BCE-DS-728A	Bridge Engineering	None		2	0	2	4	100	100	200	3 hrs	3
Domain Specific	BCE-DS-729	Disaster Risk Reduction	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-730	Advanced Design of Concrete Structures	Design of Concrete Structures	BCE-DS-607	2	0	2	4	100	100	200	3 hrs	3
Domain Specific	BCE-DS-731	Metro Systems & Engineering	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-732	Construction Safety	None		3	0	0	3	100	100	200	3 hrs	3
$The LTP distribution, Evaluation Scheme and pre-requisite(s) for Elective courses are given above. The course code will depend upon the elective(s) chosen by the student.													
@The weekly load will depend upon the electives chosen by the student .													
Note: A student may register for courses leading to a minimum of credits 13 and a maximum of 28 credits.													
*Refer to the aforementioned list of choice-based course-basket offered at the Department level. Further, under the elective courses, besides the Interdisciplinary/ Generic papers, on-line courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester at University. Student shall be required and allowed to opt for such offered courses as per limit of maximum credits and for the category of elective courses as per the University Rules.													
SEMESTER VIII													
Course Type	**Course Code**	**Title of Course**	**Pre-requisite Course, if any**		**Periods/Week**				**Marks**			**Duration of Exam**	**Credits**
			Title	**Code**	**L**	**T**	**P**	**Total**	**Int./ Cont. Evaluation**	**End Semester Exam**	**Total**		
PROJ	**Proj-CE-800A***	**Summer Internship-IV**			**Minimum 20 weeks**				**200**	**100**	**300**	**2 HOURS**	**10**
OR													
DE/OE/ME	$	Elective(s)											
Total									**200**	**100**	**300**		**10**
Discipline Elective Courses*													
Domain Specific	BCE-DS-821	Airport Planning and Design	Transportation Engineering	BCE-DS-406	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-822	Construction Equipment& Automation	Construction Project Planning & Systems	BCE-DS-603	3	0	0	3	100	100	200	3 hrs	3

Domain Specific	BCE-DS-823	Air, Noise Pollution and Control	Environmental Engineering	BCE-DS-602	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-824A	Environmental Geo-technology	None		2	0	2	4	100	100	200	3 hrs	3
Domain Specific	BCE-DS-825A	Intelligent Transportation Systems	Transportation Engineering	BCE-DS-406	2	0	2	4	100	100	200	3 hrs	3
Domain Specific	BCE-DS-826	Port and Harbour Engineering	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-827	Construction Productivity	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-828	Sustainable Construction Methods	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-829	Solid and Hazardous Waste Management	Environmental Engineering	BCE-DS-602	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-830	Prestressed Concrete	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-831A	Repairs & Rehabilitation of Structures	Concrete Technology	BCE-DS-506	2	0	2	4	100	100	200	3 hrs	3
Domain Specific	BCE-DS-832	Environmental Impact Assessment and Life Cycle Analyses	Environmental Engineering	BCE-DS-602	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-833	Earthquake Engineering	Engineering Mechanics for Civil Engineers	BCE-DS-302	3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-834	Geographic Information Systems and Science	Surveying & Geomatics	BCE-DS-403	2	0	2	4	100	100	200	3 hrs	3
Domain Specific	BCE-DS-835	Fire Resistant construction	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-836	Heritage Conservation	None		3	0	0	3	100	100	200	3 hrs	3
Domain Specific	BCE-DS-837	Water Auditing	None		3	0	0	3	100	100	200	3 hrs	3

$The LTP distribution, Evaluation Scheme and pre-requisite(s) for Elective courses are given above. The course code will depend upon the elective(s) chosen by the student.

@The weekly load will depend upon the electives chosen by the student .

*Refer to the aforementioned list of choice-based course-basket offered at the Department level. Further, under the elective courses, besides the Interdisciplinary/ Generic papers, on-line courses (MOOCs etc) and other approved courses shall be offered, which shall be notified well before start of the semester at University. Student shall be required and allowed to opt for such offered courses as per limit of maximum credits and for the category of elective courses as per the University Rules.

SEMESTER-I

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCH-106: CHEMISTRY FOR ENGINEERS

Periods/week Credits	Max. Marks	: 200
L: 3 T: 0 2	Continuous Evaluation	: 100
Duration of Examination: 3 Hrs	End Term Examination	: 100

Pre-requisite: Basic knowledge of 10+2 level Chemistry

Course Type: Basic Sciences

Course Outcomes: The course will enable the student to-

BCH-106.1. Apply fundamental principles to predict the structure, stereochemistry, bonding and general properties of materials.

BCH-106.2. Predict potential applications and practical utility of chemistry in different areas and propose suitable analytical techniques for practical applications.

BCH-106.3. Develop the understanding of water treatment techniques, electrochemical cells and combustion technology.

Unit 1: Water Treatment Chemistry (5 Lectures)

Impurities in water, Drinking Water quality standards, Hardness, types and its determination by EDTA method, Alkalinity and its determination, numerical problems based on hardness & alkalinity, Water softening methods: zeolite, ion-exchange process, Desalination of water: Reverse osmosis (RO) & Electro-dialysis process

Unit 2: Electrochemical cells and Fuels (5 Lectures)

Basic concepts of cells, Primary cells, Secondary cells and batteries, Fuel cells, Fuels and their types, Combustion technology

Unit 3: Phase Rule and its applications (4 Lectures)

3.1 Terminology of Gibb's phase rule and problems based on phase rule equation, One component system (water), Two component Eutectic system (Pb-Ag), Industrial applications of phase diagrams

Unit 4: Atomic and molecular structure (5 Lectures)

Limitations of classical mechanics in treating atomic and molecular phenomena, Schrodinger equation, Particle in a box solution and their applications for conjugated molecules and nanoparticles, Molecular orbital treatment for homo-nuclear diatomic molecules, Bonding in Coordination Compounds: Crystal field theory

Unit-5: Stereochemistry (4 Lectures)

Structural isomers and stereoisomers, Representations of 3 dimensional structures, Enantiomers, diastereomers, Absolute configurations and conformational analysis

Unit6: Analytical Techniques (5 Lectures)

Basic Principles of spectroscopy, UV- VIS spectroscopy and its applications, IR spectroscopy and its applications, Principle and analytical applications of Atomic Absorption spectroscopy, brief overview of Inductively coupled plasma mass spectrometry

Text Books/ Reference books/Web references:

1. P. C. Jain and Monica Jain, Engineering Chemistry, 2017, Dhanpat Rai Publishing Company.
2. Prasanta Rath, Subhendu Chakroborty, Chemistry, 2018, Cengage Learning Publishers.
3. B. H. Mahan,2010, University Chemistry, Pearson Education.
4. C. N. Banwell, 2008, Fundamentals of Molecular Spectroscopy, McGraw Hill Education India.
5. Gourkrishna Dasmohapatra, 2019, Chemistry-I, Vikas Publishing.
6. https://nptel.ac.in/courses/103/108/103108138/
7. https://nptel.ac.in/courses/122/101/122101001/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
Course articulation Matrix

CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BCH-106.1	3	3	1	-	1	-	-	-	-	-	-	2
BCH-106.2	3	3	2	-	2	2	2	-	-	-	-	2
BCH-106.3	3	3	2	-	2	2	2	-	-	-	-	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BMA-102: MATHEMATICS-1
(CALCULUS AND LINEAR ALGEBRA)

Periods/week	Credits	Max. Marks	: 200
L: 4 T: 1	4	Continuous Evaluation	: 100
Duration of Examination: 3 Hrs		End Semester Exam	: 100

Pre-requisites: The students must have the knowledge of mathematical concepts of Intermediate level.
Course Type: Basic Sciences

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

BMA-102.1 Students will be able to understand the role of mathematics in engineering.

BMA-102.2 Students will be able to define the terminology of Integration, Differention, Matrices and Infinite Series.

BMA-102.3 Students will be able to explain improper integrals, power series, and linear system of equations, convergence of series and physical interpretation of vector function.

BMA-102.4 Students will be able to demonstrate the knowledge of evolutes and involutes, rank of matrices, expansion of functions and diagonalization.

BMA-102.5 Students will be able to interpret the concepts of integration, differentiation, matrices and series to solve real life problems.

BMA-102.6 Students will be able to correlate the surface area, maxima and minima, eigen vectors.

PART-A

Unit 1: Integral Calculus
Evolutes and involutes, Evaluation of definite and improper integrals, Beta and Gamma functions and their properties, Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Unit 2: Differential Calculus
Rolle’s Theorem, Mean value theorems, Taylor’s and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule, Maxima and minima.

Unit 3: Sequences and Series
Convergence of sequence and series, tests for convergence, Power series, Taylor's series, series for exponential, trigonometric and logarithm functions, Fourier series: Half range sine and cosine series, Parseval’s theorem.

PART-B

Unit 4: Multivariable Calculus (Differentiation)
Limit, continuity and partial derivatives, directional derivatives, total derivative, Tangent plane and normal line, Maxima, minima and saddle points, Method of Lagrange multipliers, gradient, curl and divergence.

Unit 5: Matrices
Inverse and rank of a matrix, rank-nullity theorem, System of linear equations, Symmetric, skew-symmetric and orthogonal matrices, Determinants, Eigenvalues and Eigenvectors, Diagonalization of matrices, Cayley-Hamilton theorem and Orthogonal transformation.

Suggested Text/Reference Books

1. G.B. Thomas and R.L. Finney, 2002, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint.
2. Erwin kreyszig, 2006, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
3. Veerarajan T., 2008, Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi.
4. Ramana B.V.,2010, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint.
5. D. Poole, 2005, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole.
6. N.P. Bali and Manish Goyal, 2008, A text book of Engineering Mathematics, Laxmi Publications, Reprint.
7. B.S. Grewal, 2010, Higher Engineering Mathematics, Khanna Publishers, 36th Edition.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B. Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials.
Sessional tests.
Surprise questions during lectures/Class Performance.
End Term Examination.

Course Articulation Matrix:

CO Statement (BMA-102)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BMA-102.1	3	3	1	2	2	--	--	--	--	--	--	2	--	2
BMA-102.2	3	3	1	2	2	--	--	--	--	--	--	1	--	2
BMA-102.3	3	3	2	2	3	--	--	--	--	--	--	2	--	2
BMA-102.4	3	3	1	1	2	--	--	--	--	--	--	1	--	2
BMA-102.5	3	3	2	2	3	--	--	--	--	--	--	2	--	2
BMA-102.6	3	3	1	2	2	--	--	--	--	--	--	2	--	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCS-101: PROGRAMMING FOR PROBLEM SOLVING

Periods/week	Credits	Max. Marks	: 200
L :3 T: 0	3.0	Continuous Evaluation	: 100
Duration of Exam: 3 Hrs		End Sem Exams	: 100

Pre-Requisite: Basic Knowledge of Computers
Course Type: Program Core

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

- BCS-101.1 Formulate simple algorithms for arithmetic and logical problems
- BCS-101.2 Test and execute the programs and correct syntax and logical errors.
- BCS-101.3 Implement conditional branching, iteration and recursion
- BCS-101.4 Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- BCS-101.5 Use arrays, pointers and structures to formulate algorithms and programs.
- BCS-101.6 Apply advance C programming techniques such as pointers, dynamic memory allocation, structures to develop solutions for particular problems.

PART- A

Unit-1: Introduction to Programming

1.1 Introduction to programming
1.2 Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)
1.3 Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/ Pseudo code with examples.
1.4 From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Unit-2: Loops and Conditional Statements

2.1 Arithmetic expressions and precedence
2.2 Conditional Branching; Writing and evaluation of conditionals and consequent branching
2.3 Iteration and loops

Unit-3: Arrays and Structures

3.1 Arrays (1-D, 2-D)
3.2 Character Arrays and Strings
3.3 Structures; Defining Structures
3.4 Array of Structures

PART-B

Unit-4: Functions

4.1 Functions (including using built in libraries)
4.2 Parameter passing in functions
4.3 Call by value.
4.4 Passing arrays to functions: idea of call by reference
4.5 Recursion, as a different way of solving problems.

4.6 Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Unit-5: Basic Algorithms

5.1 Iterative Searching (Linear and Binary Search)
5.2 Basic Sorting Algorithms (Bubble, Insertion and Selection)
5.3 Finding roots of equations
5.4 Notion of order of complexity through example programs (no formal definition required)

Unit-6: Pointers and File Handling

6.1 Idea of pointers, Defining pointers
6.2 Use of Pointers in self-referential structures
6.3 Notion of linked list (no implementation)
6.4 File Handling (Basics only)

Text Books / Reference Books:

1. B. Gottfried,2015, Schaum's Outline of Programming with C, 2nd Ed., McGraw-Hill.
2. E. Balaguruswamy, 1998, Programming in ANSI C:, 2nd Ed., Tata McGraw-Hill.
3. B. W. Kernighan and Dennis M. Ritchie, 1988, The C Programming Language, 2nd Ed., PHI.

Software required/Weblinks:

Turbo C
www.tutorialpoint.com
www.nptel.com
www.w3schools.com

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

CO Statement (BCS-101)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BCS-101.1	2	3	-	-	2	-	-	-	-	-	-	3	-	-
BCS-101.2	2	1	-	1	3	-	-	-	-	-	-	-	-	1
BCS-101.3	-	-	2	-	1	-	-	-	-	-	-	1	3	2
BCS-101.4	3	2	1	2	-	-	-	-	-	-	-	1	1	3
BCS-101.5	3	-	1	3	-	-	-	-	-	-	-	3	-	2
BCS-101.6	2	2	1	3	2	-	-	-	-	-	-	-	3	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCS-100A: Artificial Intelligence for Engineers

Periods/week	Credits	Max. Marks : 200
L :2 T: 0	2.0	Continuous Assessment : 100
Duration of Exam: 3 Hrs		End Term Examination : 100

Pre-Requisite: Nil

Course Type: Engineering Science Course

Course Outcomes: The Students will be able-

BCS-100A.1 To understand evolution of Artificial Intelligence.

BCS-100A.2 To familiarize with artificial intelligence problems and their formulations.

BCS-100A.3 To Understand Intelligent system, Agents & its environment.

BCS-100A.4 To understand applications of artificial intelligence.

Unit-1: AI Introduction, Background and History

1.1 Introduction to AI
1.2 Foundations of AI
1.3 AI Evolution
1.4 Introduction to AI programming languages

Unit-2: AI Problem Formulation

2.1 AI problem formulation
2.2 Problem characteristics
2.3 Production System
2.4 Production System characteristics

Unit 3: Intelligent System & Agents

3.1 Introduction to intelligence system
3.2 Types of Intelligence
3.3 Difference between Human and Machine learning
3.4 Introduction to Agent & environment
3.5 Structure of Intelligent Agent
3.6 Nature and Properties of Environment.

Unit-4: AI Applications

4.1 Robotics
4.2 Natural Language Processing
4.3 Computer Vision
4.4 Health Care
4.5 Education
4.6 Expert System

Text Books / Reference Books:

1. Elain Rich and Kevin Knight (2009), Artificial Intelligence, 3rd edition, Tata McGraw Hill.
2. Stuart J.Russel and Peter Norvig (2009), Artificial Intelligence-A modern approach: 3rd edition, Pearson.

3. Patrick Henry Winston (1992), Artificial Intelligence , 3rdedition, , Pearson.
4. George F Luger, (2009), Artificial Intelligence : Structures and Strategies for Complex Problem Solving , University of New Mexico,6th edition, Pearson.
5. V S Janakiraman, Parerback (2005), Foundations of Artificial Intelligence And Expert Systems : 3rd edition, Macmillan India Limited

Software required/Weblinks:

http://artint.info/html/ArtInt_351.html

http://www.tutorialspoint.com/artificial_intelligence/

http://www.compinfo-center.com/tpai-t.htm

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX:

CO Statement (BCS-100A)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
BCS-100A.1	2	2	1	2									2	2	3
BCS-100A.2	2	3	2	3									2	2	3
BCS-100A.3	3	2	2	2									3	3	3
BCS-100A.4	3	3	2	3									2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BME-102: WORKSHOP/MANUFACTURING PRACTICES

Periods/week Credits		Max. Marks	: 200
L: 0 T: 0 P: 4	2	Continuous Evaluation	: 100
Duration of Examination: 3 Hrs		End Semester Exam	: 100

Prerequisites: None
Course Type: Engineering Science Course
Course Outcomes: At the end of this course, the student will be able to:

- BME-102.1 Learn the basic manufacturing/fabrication processes and develop skills to fabricate with their own hand.
- BME-102.2 Understand how to operate various traditional and modern machine tools used in industries.
- BME-102.3 Apply knowledge of the dimensional accuracies and dimensional tolerances, basics of various measuring instruments, hand tools and cutting tools.
- BME-102.4 Acquire knowledge of safety measurements
- BME-102.5 Understand the impact of manufacturing engineering solution.
- BME-102.6 Assemble different mechanical component/parts

Lectures & Videos (10 Hrs)

(i) Detailed Content

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods (3 lectures).
2. CNC machining, Additive manufacturing (1 lecture)
3. Fitting operations & power tools (1 lecture)
4. Electrical &Electronics (1 lecture)
5. Carpentry (1 lecture)
6. Plastic moulding, glass cutting (1 lecture)
7. Metal casting (1 lecture)
8. Welding (arc welding & gas welding), brazing (1 lecture)

(ii) Workshop Practice: (60 hours)

1. Machine shop (10 hours)
2. Fitting shop (8 hours)
3. Carpentry (6 hours)
4. Electrical & Electronics (8 hours)
5. Welding shop (8 hours) (Arc welding 4 hrs + gas welding 4 hrs)
6. Casting (8 hours)
7. Smithy (6 hours)
8. Plastic moulding& Glass Cutting (6 hours)

Students Project Fabrication

Students have to fabricate product from the assigned list with their own hands. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different workshop processes. The final product should be assembly of different components fabricated by different workshop practices.

For e.g. Tack-hammer; Project Display Stand; Pen stand, Screw Driver, Variable size Spanner, Electrical Extension Board with electronic circuits or any other product which should involve multiple workshop practices to fabricate a single product.

Each student will be issued the drawings of the product assembly along with the drawing of the sub-part assembly, mentioning the dimensions, tolerance, sub-products used.

Students should follow the process planning sheet of the product and get involved in different workshop practices to complete the jobs for final submission.
Note: Each student should do more than one product to get hands on experience of all the workshop practices.

Text Books:

1. H. Choudhury, S.K.,Hajra, A.K. Choudhury, and Nirjhar, S.K. Roy,2008, Elements of Workshop Technology", Vol.I and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. H. Choudhury, S.K.Hajra, A.K. Choudhury, and Nirjhar, S.K. Roy,2010, Elements of Workshop Technology, Vol. II 2010, Media promoters and publishers private limited,Mumbai.
3. S. Kalpa And S.S Steven,2002,ManufacturingEngineeringandTechnology, 4thedition, Pearson Education India Edition.
4. P. Gowri, A. Hariharan and, A.Suresh Babu, 2008, Manufacturing Technology–I, Pearson Education.
5. A.Lindberg, 1998, Processes and Materials of Manufacture,4thedition, Prentice Hall India.
6. P. N. Rao,2017, Manufacturing Technology,Vol.I and Vol.II, TataMcGrawHillHouse.

Weblinks:
https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-me21/

Instructions for setting of Paper Seven questions are to set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each part A and part B (one from each unit). Student needs to attempt two questions out of three questions from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Surprise questions during lab/Class Performance
Term end examination/viva

Course Articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BME-102.1	3	3	3	3	2	1	1	2	2	2	2	3	-	-
BME-102.2	3	3	3	3	3	2	1	2	2	2	2	2	-	1
BME-102.3	3	3	3	3	3	2	2	1	2	2	1	2	3	2
BME-102.4	2	2	2	2	3	2	1	1	2	1	2	2	1	3
BME-102.5	3	2	2	2	2	3	3	2	2	2	2	2	-	2
BME-102.6	3	3	3	2	2	1	2	2	2	3	2	2	3	1

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NAAC 'A' Grade University

BCH-151A: CHEMISTRY LAB

Periods/week	Credits	Max. Marks	: 100
P: 2	1	Continuous Evaluation	: 50
Duration of Examination: 2 Hrs		End Term Examination	: 50

Pre-requisite: Basic knowledge of 10+2 level Chemistry

Course Type: Basic Sciences Courses

Course Outcomes: The students will be able to:

BCH-151A.1. analyze the need and utility of the experiments.

BCH-151A.2. do precise quantitative measurements using volumetric glassware, analytical balance, and prepare standards solutions independently.

BCH-151A.3. carry out experiments to check the hardness, alkalinity and chloride content of different water samples and interpret the results.

BCH-151A.4. employ the basic methods/techniques to measure surface tension, viscosity, conductance, emf, saponification value of different samples.

List of Experiments:

1. Preparation and standardization of volumetric solutions.
2. Determination of viscosity using Ostwald Viscometer.
3. Determination of hardness of water by EDTA method.
4. Determination of alkalinity of water.
5. Determination of strength of solution by Conductometric titration.
6. Determination of Ferrous ion concentration using Potentiometer.
7. Determine the percentage composition of given mixture of sodium hydroxide and sodium chloride.
8. Determination of viscosity of lubricating oils using Redwood viscometers.
9. Determination of chloride content of water.
10. Determination of surface tension using Stalagmometer.
11. Determination of saponification value of oils.
12. Determination of the partition coefficient of a substance between two immiscible liquids.

Text Books/ Reference books/Web references:

1, Sunita Rattan, 2011, Experiments in Applied Chemistry, S.K.Kataria& sons.

2. Shailendra K.Sinha,2014, Physical Chemistry A Laboratory Manual, Alpha Science International Limited.

3. https://vlab.amrita.edu/index.php?sub=2&brch=190

4.https://vlab.amrita.edu/index.php?sub=2&brch=193&sim=575&cnt=1

Instructions for Exam: One experiment out of 10 given randomly needs to be performed in exams.

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

Evaluation Tools:

Experiments in lab

File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

Course articulation Matrix

CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BCH-151A.1	3	3	2	1	1	-	1	1	1	1	-	2
BCH-151A.2	3	3	2	1	2	-	1	1	1	1	-	2
BCH-151A.3	3	3	2	1	2	-	2	1	1	1	-	2
BCH-151A.4	3	3	2	1	1	-	1	1	1	1	-	2

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BCS-151: PROGRAMMING FOR PROBLEM SOLVING LAB

Periods/week	Credits	Max. Marks	: 100
P :2	1.0	Continuous Evaluation	: 50
Duration of Exam: 2 Hrs		End Sem Exams	: 50

Co-Requisite: Programming for problem solving (ESC-CS-103)
Course Type: Program Core

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

BCS-151.1. formulate the algorithms for simple problems in C language.
BCS-151.2. correct syntax errors as reported by the compilers as well as at run time
BCS-151.3. write iterative as well as recursive programs
BCS-151.4. represent data in arrays, strings and structures and manipulate them implement and simulate the various graph traversing algorithms.
BCS-151.5. declare pointers of different types and use them in defining self referential structures.
BCS-151.6. create, read and write to and from simple text files.

NOTE: The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

List of Practicals:

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment
Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions
Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures
Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series
Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation
Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations
Tutorial 7: Functions, call by value:
Lab 7: Simple functions
Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems
Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions
Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures
Tutorial 12: File handling:
Lab 12: File operations

Software required/Weblinks:
Turbo C
www.tutorialpoint.com
www.nptel.com
www.w3schools.com

Note: At least 5 more exercises to be given by the teacher concerned.

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Assessment Tools:
Experiments in lab
File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX

CO Statement (BCS-151)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BCS-151.1	2	1	-	-	3	-	-	-	-	-	-	1	1	1
BCS-151.2	3	-	-	3	2	-	-	-	-	-	-	-	2	3
BCS-151.3	3	1	2	3	-	-	-	-	-	-	-	-	1	2
BCS-151.4	2	3	1	2	3	-	-	-	-	-	-	1	3	2
BCS-151.5	-	2	1	2	2	-	-	-	-	-	-	2	1	2
BCS-151.6	3	-	1	-	3	-	-	-	-	-	-	2	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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BHM 201: English

Periods/week Credits	Max. Marks: 100
L: 2 T:0 P:0 2	Continuous Evaluation: 50
Duration of Exam: 2 Hours	External (Written): 50

Prerequisites:
Students are expected to have an inclination towards understanding the need for life skills required to succeed in their career and should know Basic English.

Course Type: Program Core

Course Outcomes: The students would be able to-
BHM 201.1. Speak in English confidently
BHM 201.2. Acquire proficiency in reading and writing skills
BHM 201.3. Communicate in grammatically correct English.
BHM 201.4. Create and deliver presentations confidently.
BHM 201.5 Understand the meaning of professional communication.

Unit 1. Vocabulary Building
1.1 The concept of Word Formation
1.2 Root words from foreign languages and their use in English
1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
1.4 Synonyms, antonyms, and standard abbreviations.

Unit 2. Basic Writing Skills
2.1 Sentence Structures
2.2 Use of phrases and clauses in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Organizing principles of paragraphs in documents
2.6 Techniques for writing precisely

Unit 3. Identifying Common Errors in Writing
3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés

Unit 4. Nature and Style of sensible Writing
4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence
4.5 Writing introduction and conclusion

Unit 5. Writing Practices
5.1 Email Writing
5.2 Cover Letter
5.3 Essay

Unit 6. Oral Communication

6.1Listening Comprehension
6.2 Pronunciation, Intonation, Stress and Rhythm
6.3Common Everyday Situations: Conversations and Dialogues
6.4 Communication at Workplace
6.5Interviews
6.6Formal Presentations

Text Books/Reference Books:

- F.T. Wood.2007, Remedial English Grammar. Macmillan.
- William Zinsser,2001, On Writing Well, Harper Resource Book.
- Liz Hamp-Lyons and Ben Heasly. 2006, Study Writing. Cambridge University Press.
- Sanjay Kumar and PushpLata, 2011, Communication Skills. Oxford University Press.

Web links:

- https://www.mindtools.com/
- https://www.slideshare.net/
- http://ndl.iitkgp.ac.in
- hbx.hbs.edu

Distribution of Continuous Evaluation:

Sessional 1	15%
Sessional 2	15%
Assignment	10%
Class Performance	5%
Attendance	5%
End Term Exam	50%

Instructions for Paper Setting:

- **Section A- MCQ's- 30 marks**
- **Section B- 2 short questions- 10 marks**
- **Section C- 2 short questions, 10 marks**

Assessment Tools:

- **Assessment of sessional 1 through In Class Presentations.**
- **Continuous evaluation**
- **Assignments**
- **Attendance**
- **Marks for Behavior and soft skills displayed in the class**

Course Articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BHM 201.1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
BHM 201.2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1
BHM 201.3	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
BHM 201.4	-	-	-	-	-	-	-	-	2	-	1	-	-	-	1	1
BHM 201.5	-	-	-	-	-	-	-	1	1	-	2	-	-	-	1	1

BCH-MC-002: ENVIRONMENTAL SCIENCE

Periods/week	Max. Marks	: 100
L: 1 T:1 C: AP	Continuous Evaluation	: 50
	End Sem Exams	: 50

Pre-requisite: Basic knowledge of Environment related issues
Course Type: Mandatory
Idea of an activity based course on environment protection is to sensitize the students on environment related issues through various activities. Students must understand that each and every action of ours reflects on the environment and vice versa.

Activities:

i) Small group meetings about conservation and management of natural resources, conservation of biodiversity, solid waste management and environmental remediation
ii) Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
iii) Expert talk
iv) Slogan writing /Poster making event
v) Cycle rally to create awareness on issues like pollution control, cleanliness, and waste management.
vi) Plantation activity
vii) Cleanliness drive
viii) Drive for segregation of waste
ix) Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
x) Environment protection related efforts

The break-up for marks

Internal Marks
Evaluation based on participation in activities: 50 marks

External Marks
Field work, Report writing & Viva: 20+20+10 = 50 marks

Distribution of Continuous Evaluation:

Parameter	Weightage
Two Sessional (Mid-Term)Tests	60%
Assignments	20%
Class Performance	10%
Class Attendance	10%

SEMESTER-II

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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NAAC 'A' Grade University

BPH-106: PHYSICS FOR ENGINEERS

Periods/week Credits		Max. Marks	: 200
L: 3 T:0	3	Continuous Evaluation	: 100
Duration of Examination: 3 Hrs		End Term Examination	: 100

Pre-requisite: Basic knowledge of 10+2 level Physics

Course Type: Basic Sciences

Course Outcomes: The students will be able to:

BPH-106.1 discuss and explain the key concepts and principles of quantum physics, lasers and optical fibres

BPH-106.2 apply the basic concepts of semiconductors and devices based on them

BPH-106.3 analyze the structure, characterization techniques and applications of advanced material.

BPH-106.4 recall the basic concept of electromagnetism and understand their applications to the theoryof electromagnetic waves.

Unit-1 Semiconductors (8 Lectures)

Physical properties of semiconductors, direct and indirect band gap semiconductors, compound semiconductors, organic and inorganic semiconductors, Fermi level and Fermi energy, occupation probability, concentration of charge carriers, generation and recombination, carrier transport: drift and diffusion, energy band diagram of unbiased and biased P N Junction, Light Emitting Diode, Photodetectors - p-n photodiode, PIN, Photoconductivity, Effect of impurity & Traps, Photovoltaic effect and Solar cell.

Unit-2 Quantum Physics (8 Lectures)

Limitations of classical physics, Black-body radiations, Planck's hypothesis, Photo-electric effect, Compton effect, Uncertainty principle, Matter waves, Phase and group velocity, Schrodinger's equations (time dependent and independent), Particle in a box (motion in one dimension), Basics of quantum statistics.

Unit-3 Lasers and Optical Fibres (8 Lectures)

Introduction to laser, Spontaneous and stimulated emissions of radiations, Einstein's coefficients and relation among them, Population inversion and laser pumping, Characteristics of lasers, Components of laser, He-Ne laser, Semiconductor laser, Applications of laser.

Introduction to optical fibres, Acceptance angle and acceptance cone, Numerical aperture, Classification of fibres, Attenuation, Losses associated with optical fibres, Merits and applications of optical fibres.

UNIT 4: Advance Material and Synthesis (6 Lectures)

Introduction to nanomaterials, Nano-science and nano-technology, Two main approaches in nanotechnology, Bottom up technique, Top down technique, Quantum dot and graphene, Methods to produce Nanomaterials, Chemical vapour deposition, Sol-gel process, Molecular beam epitaxy, Physical and chemical properties of nanomaterials, Carbon nanotubes: single and multi-walled nanotubes, Synthesis of Nanotubes: carbon arc method, Laser evaporation method, Sputtering, applications of advanced materials.

UNIT 5: Investigating Techniques (6 Lectures)

Properties of X-Ray,Braggs' Law, Bragg's Spectrometer, Rutherford Back Scattering, Raman effect and Raman spectroscopy, Hall effect, Vander Pauw measurements for carrier density, resistivity, Hot-point probe measurement, AFM, SEM, photoluminescence spectroscopy, band gap by UV-Vis spectroscopy.

Unit-6 Electrodynamics (8 Lectures)

Divergence and curl of electrostatic field, Laplace's and Poisson's equations for electrostatic potential. Solutions of Laplace equation in one dimension, Dielectric Polarization and Dielectric constant, Piezoelectricity, Bio-Savart law and Ampere's circuital theorem, Continuity equation for current densities, Displacement current, Maxwell's equations, Electromagnetic energy – Flow of energy and Poynting vector, The wave equation; Plane electromagnetic waves in vacuum, their transverse nature, Energy carried by electromagnetic waves.

Text Books/ Reference Books:

1. P. Bhattacharya,2017, Semiconductor Optoelectronic Devices, Pearson education.
2. D.J Griffiths, 2015, Introduction to Electrodynamics, Pearson education.
3. Avadhanulu and Kshirsagar,2014, A textbook of Engineering Physics S. Chand.
4. S.P. Taneja,2018, Modern Physics for Engineers, R. Chand & Co.
5. Mark Ratner and Daniel Ratner, 2003,Nanotechnology, Pearson.
6. M.N.O. Sadiku, 2015, Elements of Electromagnetics, Asian Edition, Oxford Higher Education.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Assignments, Sessional and End Semester Examination paper will consist of various difficulty levels to accommodate the different capabilities of students. Assessment should cover all course outcomes and upper limit for lower order skills will be 40% (for knowledge-oriented questions). However, weightage for different cognitive levels in the question papers can vary.

Course articulation Matrix

CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BPH-106.1	2	2	1	2	3	-	-	-	-	-	2	3
BPH-106.2	3	1	3	-	2	1	1	-	-	-	-	3
BPH-106.3	3	2	2	-	2	2	1	-	-	-	-	2
BPH-106.4	3	3	3	1	1	3	1	-	-	-	-	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BMA-202: MATHEMATICS-2

(Calculus, ordinary Differential Equations and Complex variables)

Periods/week Credits	Max. Marks	: 200
L: 3 T: 1 4	Continuous Evaluation	: 100
Duration of Examination: 3 Hrs	End Semester Exam	: 100

Pre-requisites: The students must have the knowledge of mathematical concepts of Intermediate level and Mathematics-1.

Course Type: Basic Sciences

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

BMA-202.1 Students will be able to recognize the application of mathematics in engineering.

BMA-202.2 Students will be able to describe the knowledge of multiple Integration and Differentiation in the field of complex functions.

BMA-202.3 Students will be able to demonstrate the concepts of differential equations of higher order.

BMA-202.4 Students will be able to distinguish between real and complex functions.

BMA-202.5 Students will be able to interpret the concept of complex integration for those functions which are not defined on real line.

BMA-202.6 Students will be able to evaluate improper integrals using complex integration.

PART-A

Unit 1: Multivariable Calculus (Integration)

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

Unit 2: First Order Ordinary Differential Equations

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Unit 3: Ordinary Differential Equations of Higher Orders

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation, Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

PART-B

Unit 4: Complex Variable – Differentiation

Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties, Conformal mappings, Mobius transformations and their properties.

Unit 5: Complex Variable – Integration

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof), Taylor's series, zeros of analytic functions, singularities, Laurent's series, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

Suggested Text/Reference Books

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

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix:

CO Statement (BMA-202)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BMA-202.1	3	3	2	2	2	--	--	--	--	--	--	2	--	2
BMA-202.2	3	3	2	2	2	--	--	--	--	--	--	1	--	2
BMA-202.3	3	3	2	2	3	--	--	--	--	--	--	2	--	2
BMA-202.4	2	2	3	1	2	--	--	--	--	--	--	1	--	2
BMA-202.5	3	3	2	2	3	--	--	--	--	--	--	2	--	2
BMA-202.6	3	3	1	2	2	--	--	--	--	--	--	2	--	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BEE-101: BASIC ELECTRICAL ENGINEERING

Periods/week Credits		Max. Marks	: 200
L: 3 T: 0	3	Continuous Evaluation	: 100
Duration of Examination: 3 Hours		End Semester Exam	: 100

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

BEE-101.1 The students will be able to describe the basic electrical laws, theorems, components of electrical system, power converters, earthing and working of batteries.

BEE-101.2 The students will be able to apply the theorems and laws for solving both dc and ac networks.

BEE-101.3 The students will be able to differentiate single phase and three phase system.

BEE-101.4 The students will be able to explain the construction and working of transformers and electrical machines.

BEE-101.5 The students will be able to analyze and compare the concepts of dc and ac machines

PART-A

Unit 1: DC CIRCUITS

1.1 Electrical circuit elements (R, L and C), voltage and current sources,
1.2 Kirchoff Voltage and Current Laws,
1.3 Analysis of simple circuits(two loops) with dc excitation,
1.4 SuperpositionTheorem,
1.5 Thevenin'sTheorem,
1.6 Norton'sTheorem,
1.7 Time domain analysis of first order system- RL circuit,
1.8 Time domain analysis of first order system- RC circuit.

Unit 2: AC CIRCUITS

2.1 Single Phase-AC Generation,
2.2 SinusoidalWaveform- peak value average and rms values
2.3 Phasorrepresentation, L, C, RL, RC circuit
2.4 RLC Series Circuits
2.5 Power factor, Real power, Reactive power and Apparent power
2.6 RLC parallel circuits
2.7 Resonance
2.8 Three Phase Emf Generation, Delta and Star Connections
2.9 Voltage and current relation in star and delta connections

Unit 3: TRANSFORMERS

3.1 Magnetic materials
3.2 BH characteristics,
3.3 Working Principle and Emf Equation of transformer,
3.4 Ideal and Practical transformer,
3.5 Equivalent circuit Losses in transformer,
3.6 Efficiency and regulation of transformer
3.7 Autotransformer
3.8 Three phase transformer connections.

PART-B

Unit 4: DC MACHINES

4.1 Construction and working of DC motor,
4.2 Torque-speed characteristic and speed control of separately excited dc motor,
4.3 Construction and working of DC generator,
4.4EMF equation of DC generator,
4.5 Introduction to power converters/power switching devices.

Unit 5: AC MACHINES

5.1 Generation of rotating magnetic fields,
5.2 Construction and working of a three-phase induction motor
5.3 Significance of torque-slip characteristic,
5.4 Loss components and efficiency of three phase induction motor
5.5 Starting and speed control of induction motor,
5.6 Single-phase induction motor working and types
5.7 Construction and working of synchronous generators.

Unit 6: ELECTRICAL INSTALLATIONS

6.1 Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB,
6.2 Types of Wires and Cables,
6.3 Earthing,
6.4 Types of Batteries, Important Characteristics for Batteries,
6.5 Elementary calculations for energy consumption,
6.6 Power factor improvement and battery backup.

Text Books/ Reference Books:

1. I. J. Nagrath, D. P. Kothari ,2007, Basic Electrical Engineering, TMH.
2. S. Nath Chakrabarti, C. K. Chanda , 2009, Basic Electrical Engineering, TMH,2009.
3. B. L. Thereja, 2005, Electrical Technology Vol.1, S Chand.
4. V. N. Mittal, Aravind Mittal, 2007, Basic Electrical Engineering,TMH 2007.
5. S N Singh , 2011, Basic Electrical Engineering, PHI.
6. D. C. Kulshreshtha, 2009, Basic Electrical Engineering, McGrawHill.
7. Leonard S Bobrow,2011, Fundamentals of Electrical Engineering, 2nd edition, Oxford University Press.
8. E. Hughes, 2010, Basic Electrical Engineering, Pearson.
9. S. K.Sahadev,2015, Basic Electrical Engineering, Pearson India.

Software required/Weblinks

http://nptel.ac.in/courses/108105053/
https://nptel.ac.in/courses/108108076/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%

Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX

CO Statement (BEE-101)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BEE-101.1	3	3	2	1	2	-	-	-	-	-	-	2	3	1
BEE-101.2	3	3	2	1	2	-	-	-	-	-	-	2	3	1
BEE-101.3	3	3	2	1	2	-	-	-	-	-	-	2	3	1
BEE-101.4	3	3	2	1	2	-	-	-	-	-	-	2	3	1
BEE-101.5	3	3	2	1	2	-	-	-	-	-	-	2	3	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

BME-101A: ENGINEERING GRAPHICS & DESIGN

Periods/week Credits	Max. Marks : 200
L: 0 T: 0 P: 4 2	Internal/Continuous Assessment : 100
Duration of Examination: 3 Hrs	End Semester Exam : 100

Prerequisites:
Course Type: Engineering Science Course
Course Coordinator / Co-Coordinator:

Course Outcomes:
After completion of this course the students will be able to

BME-101A.1	understand the role and importance of Engineering Graphics, design/drafting in cognitive development.
BME-101A.2	conceptualize engineering drawing and descriptive geometry to understand different components and machineries.
BME-101A.3	visualize objects with the help of engineering principles, projection theories including their applications to solve problems related to engineering and production.
BME-101A.4	develop capability of understanding engineering drawing problems and implementation of respective solution.
BME-101A.5	develop capability of selection of solutions for a given design problem.
BME-101A.6	develop of capability of designing a product or assembly with its various components with a systematic design approach

Theory (Detailed Content)
Traditional Engineering Graphics:
Principles o f Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

(**Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory**)

Part-A

Unit 1: Introduction to Engineering Drawing, Orthographic Projections
Principles of Engineering Graphics and their significance, usage of drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales; Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Unit 2: Projections of Regular Solids & Sections and Sectional Views of Right Angular Solids

Inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc.

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only).

Unit 3: Isometric Projections

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric

Views to Orthographic Views and Vice-versa, Conventions;

Theory (Detailed Content)

Computer Graphics

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

(**Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory**)

Part-B

Unit 4: Overview of Computer Graphics, Customization & CAD Drawing

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids; consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

Unit 5: Annotations, layering, other functions

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

Unit 6: Demonstration of a simple team design project

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

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. (Corresponding set of) CAD Software Theory and User Manuals

Reference Books:

1. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
2. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers

Weblinks:

https://nptel.ac.in/courses/112103019/
https://nptel.ac.in/courses/112104172/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 11**	**PSO 12**	**PSO 13**
BME-101A.1	2	1	1	1	1	2	1	2	1	1	2	3	3	3	2
BME-101A.2	2	2	3	1	1	2	2	2	2	2	3	2	3	3	1
BME-101A.3	2	2	2	2	2	1	2	1	3	2	2	2	3	3	2
BME-101A.4	3	3	2	3	2	1	2	2	1	1	2	1	3	3	1
BME-101A.5	3	3	2	3	2	1	2	1	1	1	2	1	3	-	-
BME-101A.6	2	1	3	2	3	2	2	2	3	2	2	1	-	-	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BBT-100 BIOLOGY FOR ENGINEERS

Periods/week	Credits	Max. Marks : 200
L: 2 T: 0 P:0	02	Continuous Evaluation : 100
Duration of Examination: 3 Hrs		End Semester Examination:100

Pre-requisites: Knowledge of 10+2 Science
Course Type: Basic Sciences

Course Outcomes:
The students will be able to-

BBT-100.1 describe the taxonomic diversity of life forms and their functions.
BBT-100.2 assess the role of biomolecules in physiology and genetics.
BBT-100.3 illustrate the structural and functional organization of the human body.
BBT-100. 4 apply the principles of biology for sustenance.

PART-A

Unit 1: The Living World
1.1 What is living World?
1.2 Diversity in the living world
1.3 Taxonomy and Biological Classification
1.4 Structural organization in plants and animals
1.5 Cell- The unit of Life

Unit 2: Microbiology
2.1 Microbial diversity, Ecology and Population dynamics, Microbial growth on surfaces Environmental effect on microbial growth.
2.2 Bioremediation, examples of bioremediation, Acid mine drainage, Enhanced metal recovery, Wastewater microbiology
2.3 Solid waste microbiology, Landfills, Leachate, Anaerobic degradation phases.
2.4 Antimicrobial resistance

PART-B

Unit 3: Biochemistry
3.1 Carbohydrates- monosaccharides, disaccharides and Polysaccharides,
3.2 Lipids- fatty acids, fats and oils, lipids of biological importance
3.3 Amino acids – essential and non-essential amino acids, peptide bond formation
3.4 Proteins- overview of proteins synthesis, structural organization, functions of proteins
3.5 Nucleic acids- structure and functions of DNA and RNA.
3.6 Enzymes: role as biological catalysts, Mechanism of enzyme action, Industrial applications of enzymes

Unit 4: Human Anatomy
4.1 General Anatomy- Basic terms in anatomy- Anterior, posterior, lateral, medial, Elementary tissues of the human body
4.2 Cardiovascular system, Respiratory System
4.3 Gastrointestinal System, Genito-urinary system
4.4 Musculoskeletal system, Nervous system & Sense organs
4.5 Endocrine System

Unit 5: Human Physiology
5.1 Body fluids and salts, composition and functions of blood, Blood groups, blood clotting

5.2 Cardiac cycle and heart sounds, Electrocardiogram (ECG), Blood pressure, Hypertension, Hypotension, Arteriosclerosis, Atherosclerosis, Angina, Myocardial infarction, Congestive heart failure and cardiac arrhythmias
5.3 Respiratory volumes and capacities, Hypoxia, Asphyxia
5.4 Disorders of GIT, Endocrine disorders
5.5 Microbial infections, Cancer

Unit 6: Genetics & Computational Approach to Biology
6.1 Genetics- DNA as a blueprint and RNA as a messenger, from DNA sequence to Genes (From alphabets to words), Mendelian Inheritance
6.2 DNA to Chromosomes- Genes and Mutations, Information pathways – Replication, Transcription and Translation, Epigenetic Modifications.
6.3 Computational Approach to Biology- Finding a needle in the haystack – Making sense of the Big Data,Types of Biological Datasets.
6.4 The "Omics" Approach, Introduction to Network Biology - Basics of Graph and Network Theory, Cellular Networks.

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

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BBT-100.1	2	1	1	-	-	1	1	-	-	-	3	2	1	2	-	1
BBT-100.2	3	2	2	-	-	2	2	-	-	-	3	3	2	0	-	1
BBT-100.3	3	3	3	-	-	3	3	-	-	-	3	3	1	1	-	1
BBT-100.4	3	3	3	-	-	3	3	-	-	-	3	3	3	1	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BPH-151A: PHYSICS LAB

Periods/week	Credits	Max. Marks	: 100
P: 2	1	Internal	: 50
Duration of Examination: 2 Hrs		External	: 50

Pre-requisite: Basic knowledge of 10+2 level Physics

Course Type: Basic Sciences Courses

Course Outcomes: The students will be able to:

BPH-151A.1 calculate zero error, least count, maximum percentage error, percentage error and understand their importance

BPH-151A.2 understand the principle, concept and working of the experiments

BPH-151A.3 rearrange/assemble the different components of a device or a circuit

BPH-151A.4 describe the methodology of science and the relationship between observation and theory

List of Experiments:

1. To calculate the hysteresis loss and magnetic susceptibility by tracing B- H curve.
2. To determine the value of Planck's constant h by a photo cell.
3. To determine the grating element of a given grating by using LASER.
4. To study Hall Effect in a semiconductor and to find (i) Hall voltage and Hall coefficient (ii) number of charge carriers per unit volume (iii) mobility.
5. To draw the characteristics of a solar cell and to find the fill factor.
6. To find the band gap of an intrinsic semiconductor using four probe method.
7. To draw the V-I characteristics of a PIN diode.
8. To determine numerical aperture of an optical fibre.
9. To determine the volume magnetic susceptibility of manganese sulphate solution at different concentrations.
10. To find the charge to mass (e/m) ratio of an electron.
11. To study the resonance phenomena in LCR circuits.
12. To study the variation of magnetic field from Helmholtz coil.
13. To determine the moment of inertia of a flywheel.
14. To determine the Young's modulus of the material of a given beam supported on two knife-edges and loaded at the middle point.
15. To determine the Modulus of Rigidity of a wire by Maxwell's Needle.

Text Books/References:

1. S. L. Gupta & V. Kumar, Practical Physics, 2018, Pragati Prakashan.

2. S.L. Arora, B.SC, Practical Physics, 2010, S. Chand.

3. NPTEL video lectures for Experimental Physics.

Instructions for Exam: One experiment out of 10 given randomly needs to be performed in exams.

Assessment Tools:

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Assessment Tools:

Experiments in lab

File work/Class Performance

Viva (Question and answers in lab)

End Term Practical Exam

Course articulation Matrix

CO Statement	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
BPH-151A.1	3	1		1				1	1	1		3
BPH-151A.2	2		2		2				1	1		2
BPH-151A.3	2	3	2	3	3				3		1	3
BPH-151A.4	3	1	2		1		1	1	1	1		3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BEE-151A: BASIC ELECTRICAL ENGINEERING LAB

Periods/week	Credits	Max. Marks	: 100
P: 2	1	Continuous Evaluation	: 50
Duration of Examination: 2 Hours		End Semester Exam	: 50

Course Outcomes

BEE-151.1 The students will be able to understand with the basic electrical laws, theorems and their applications to the D.C and A.C networks.
BEE-151.2 The students will be able to know the basic concepts of three phase system
BEE-151.3 The students will be able to understand the construction and working of transformers
BEE-151.4 The students will be able to study the working principles of electric machines and power converters
BEE-151.5 The students will be able to study the components of low voltage electrical installations.

LIST OF EXPERIMENTS:

1. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors andinductors.
2. To measure the steady-state and transient time-response of R-L circuits to a step change in voltage (transient may be observed on a storage oscilloscope).
3. To measure the steady-state and transient time-response of R-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope).
4. To examine sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage.
5. To find the resonance frequency inR-L-C circuits.
6. To observe the no-load current waveform of transformer on an oscilloscope (non- sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics).
7. To perform Load test on a transformer: measurement of primary and secondary voltages and currents, and power.
8. To connect Three-phase transformers in Star and Delta and verify voltage and current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side and to measure three-phase power in balanced three-phase circuits.
9. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winding - slip ring arrangement) and single-phase induction machine.
10. To draw Torque -Speed Characteristic of separately excited dcmotor.
11. To find Synchronous speed of two and four-pole three-phase induction motors, check Direction reversal by change of phase-sequence of connections and to draw Torque-Slip Characteristic of an induction motor.
12. To operate Synchronous Machine as a generator, observe stand-alone operation with a load and control of voltage through field excitation.
13. To Study components of LT, switchgear- MCB, ELCB, MCCB.
14. To Study DC-DC Converter

Text Books:
N K Jain, 2010, A text book of Practicals in Electrical Engineering, Dhanpatrai Publishing Co.

NOTE: Every student needs to do minimum 10 numbers of experiments/practicals in a semester. At least 20% new experiments to be added annually

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Evaluation Tools:

Experiments in lab

File work/Class Performance
Viva (Question and answers in lab)
End Term Practical Exam

COURSE ARTICULATION MATRIX

CO Statement (BEE-151)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2
BEE-151.1	3	-	3	3	2	2	1	1	1	2	1	2	1	2
BEE-151.2	3	2	2	2	1	1	1	-	2	-	2	-	2	-
BEE-151.3	1	-	2	3	-	-	2	-	1	2	1	1	2	1
BEE-151.4	3	2	2	3	-	-	2	2	-	-	2	-	1	-
BEE-151.5	-	-	2	2	-	1	2	-	1	-	1	2	-	1

BHM-151: ENGLISH LAB

Periods/week Credits	Max. Marks	: 100
L: 0 T:0 P:2 1	Continuous Evaluation	: 50
Duration of Exam: 2 Hours	End Sem Exams	: 50

Prerequisites: Basic knowledge of English language
Course Type: Program Core

Course Outcomes: At the end of this course, the student will be able to:
BHM-151.1. speak in English confidently.
BHM-151.2. develop the understanding of correct pronunciation and intonation.
BHM-151.3. communicate professionally in a corporate environment.

List of Activities
1. Listening exercises for correct pronunciation and intonation
2. Role plays for speaking confidently
3. Group Discussions
4. Extempore
5. Mock Interviews
6. In Class Presentations
7. JAM Sessions
8. Theatre activity

Text Books/Reference Books:
1. L. Hamp-Lyons and B.Heasly, 2006, Study Writing, Cambridge University Press.
2. S. Kumar and P. Lata, 2011, Communication Skills, Oxford University Press.
3. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press.

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Assessment Tools:
1 Experiments in lab
2 File work/Class Performance
3 Viva (Question and answers in lab)
4 End Term Practical Exam

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A' Grade University

BHM-MC-001: Constitution of India

Periods/week Credits	Max. Marks	: 100
L: 1 T:1 P:0 AP	Continuous Evaluation	: 50
Duration of Examination: 2 Hours	End Sem Exam	: 50

Pre-Requisite: Nil
Course Type: HSMC

Course Outcome: The students will be able to-
CO 1: Understand the principles and ideals of the Indian Constitution.
CO 2: Introduce constitutional design of state structures and institutions.
CO 3: Understand the working of the state and its institutions.

PART-A

Unit 1: The Constituent Assembly and the Constitution

1.1. Drafting of the Constitution
1.2. Philosophy and Features
1.3. Fundamental Rights and Directive Principles

Unit 2: The Legislature

2.1. Legislative Procedures in the Union Legislature
2.2. Comparative Analysis of the Powers of Lok Sabha and Rajya Sabha
2.3. Influence of state legislatures on legislation

Unit 3: The Executive

3.1. Union Executive- Structure and Functions
3.2. Real Head and Formal Head of the state
3.3. Distribution of Executive Powers between the Union and the State

PART-B

Unit 4: The Judiciary

4.1. Hierarchical Judicial Structure between Union and States
4.2. Functions and Powers
4.3. Independence of Judiciary
4.4. Judicial Activism, Judicial Review and Public Interest Litigation

Unit 5: Checks and Balances between the Organs of the Government

5.1. Passage of Money Bills
5.2. No-confidence Motion
5.3. Individual and Collective Responsibility of the Council of Ministers
5.4. Impeachment of President

Unit 6: Division of Powers between the Union and the State

6.1. Federalism

6.2. Inter-state Relations
6.3. Decentralization

Text books/reference books:

1. R. Bhargava, (2008) 'Introduction: Outline of a Political Theory of the Indian Constitution', in R. Bhargava (ed.) Politics and Ethics of the Indian Constitution, New Delhi: Oxford University Press, pp. 1-40.
2. G. Austin, (2000) 'The Social Revolution and the First Amendment', in Working a Democratic Constitution, New Delhi: Oxford University Press, pp. 69-98.
3. Sibal, (2010) 'From Niti to Nyaya,' Seminar, Issue 615, pp 28-34.
4. Shankar and V. Rodrigues, (2011) 'The Changing Conception of Representation: Issues, Concerns and Institutions', in The Indian Parliament: A Democracy at Work, New Delhi: Oxford University Press, pp. 105-173.
5. V. Hewitt and S. Rai, (2010) 'Parliament', in P. Mehta and N. Jayal (eds.) The Oxford Companion to Politics in India, New Delhi: Oxford University Press, pp. 28-42.
6. J. Manor, (2005) 'The Presidency', in D. Kapur and P. Mehta P. (eds.) Public Institutions in India, New Delhi: Oxford University Press, pp.105-127.
7. J. Manor, (1994) 'The Prime Minister and the President', in B. Dua and J. Manor (eds.) Nehru to the Nineties: The Changing Office of the Prime Minister in India, Vancouver: University of British Columbia Press, pp. 20-47.
8. U. Baxi, (2010) 'The Judiciary as a Resource for Indian Democracy', Seminar, Issue 615, pp. 61-67.
   R. Ramachandran, (2006) 'The Supreme Court and the Basic Structure Doctrine' in B. Kirpal et.al (eds.) Supreme but not Infallible: Essays in Honour of the Supreme Court of India, New Delhi: Oxford University Press, pp. 107-133.
9. M. Singh, and R. Saxena (eds.), (2011) 'Towards Greater Federalization,' in Indian Politics: Constitutional Foundations and Institutional Functioning, Delhi: PHI Learning Private Ltd., pp. 166-195.
10. V. Marwah, (1995) 'Use and Abuse of Emergency Powers: The Indian Experience', in B. Arora and D. Verney (eds.) Multiple Identities in a Single State: Indian Federalism in a Comparative Perspective, Delhi: Konark, pp. 136-159.
11. B. Sharma, (2010) 'The 1990s: Great Expectations'; 'The 2000s: Disillusionment Unfathomable', in Unbroken History of Broken Promises: Indian State and Tribal People, Delhi: Freedom Press and SahyogPustakKuteer, pp. 64-91.
12. P. deSouza, (2002) 'Decentralization and Local Government: The Second Wind of Democracy in India', in Z. Hasan, E. Sridharan and R. Sudarshan (eds.) India's Living Constitution: Ideas, Practices and Controversies, New Delhi: Permanent Black, pp. 370-404.
13. M. John, (2007) 'Women in Power? Gender, Caste and Politics of Local Urban Governance', in Economic and Political Weekly, Vol. 42(39), pp. 3986-3993.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit) Student needs to attempt two questions out of three from each part. Each question will be of 10 marks.

Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Class Work/ Performance	20%
Attendance	20%

COURSE ARTICULATION MATRIX :

CO Statement (BHM-MC-001)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BHM-MC-001.1	3	3	2	-	-	-	-	-	-	-	-	-	-	-
BHM-MC-001.2	3	3	2	-	-	-	-	-	-	-	-	-	-	-
BHM-MC-001.3	3	3	3	-	-	-	-	-	-	-	-	-	-	-

SEMESTER-III

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

PROJ-CE-300A: SUMMER INTERNSHIP-I

Credits 1 | Max. Marks : 50
Practical/Week 2 | Continuous Evaluation : 50

Prerequisites: None
Course Type: Project Work

Course Outcomes: At the end of this course, the student will be able to:
PROJ-CE-300A.1. Identify various civil related software.
PROJ-CE-300A.2. Develop soft skills.
PROJ-CE-300A.3. Explore the various possibilities of a career in this field.
PROJ-CE-300A.4. Make use of basic Civil engineering Labs.
PROJ-CE-300A.5. Create reports on the undertaken lab work.

Every student will have to undergo 60 Hours Summer Internship over a period of 04 weeks in the Civil Engineering Department Labs. The training will comprise of session on the following areas:

- Soft skill development
- Innovation/ Entrepreneurship
- Civil Engineering Lab Work

The parameters for evaluation during the training shall be as under:

Presentation/Viva:	20 Marks
Report:	10 Marks
Class Performance:	10 marks
Attendance:	10 Marks

	50

ARTICULATION MATRIX

CO Statement (PROJ-CE-300A)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
PROJ-CE-300A.1	1	-	3	-	1	-	-	-	-	-	-	-	-	2
PROJ-CE-300A.2	-	1	-	-	-	1	1	-	-	2	2	-	2	-
PROJ-CE-300A.3	-	-	-	-	-	-	1	1	-	-	-	-	1	-
PROJ-CE-300A.4	-	2	2	2	1	2	-	2	2	-	-	1	1	2
PROJ-CE-300A.5	2	2	2	2	1	1	-	2	1	3	2	2	-	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-302A: ENGINEERING MECHANICS FOR CIVIL ENGINEERS

Credits 3	Max. Marks : 200
L-T-P 3-1-0	Continuous Evaluation : 100
Examination Duration 3 hrs	End Semester Exam : 100

Prerequisites:
Course Type: Core

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

BCE-DS-302A.1	Use scalar and vector analytical techniques for analysing forces in statically determinate structures
BCE-DS-302A.2	Apply fundamental concepts of Engineering mechanics to the analysis of simple, practical problems
BCE-DS-302A.3	Analyse basic beams and trusses using statics concepts
BCE-DS-302A.4	Correlate basic dynamics concepts – force, momentum, work and energy
BCE-DS-302A.5	Associate other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle, the coefficient of restitution and simple harmonic motion.
BCE-DS-302A.6	Createsystem problems in general plane motion based on concepts of mechanics(Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces)

PART-A

Unit 1: Introduction to Engineering Mechanics

1.1 Force Systems
1.2 Particle equilibrium in 2-D& 3-D; Rigid Body equilibrium
1.3 Resultant- Moment of Forces and its Application; Couples and Resultant of Force System
1.4 Equilibrium of System of Forces; FBDs; Equations of Equilibrium of Coplanar Systems and Spatial Systems
1.5 Static Indeterminacy
1.6 Friction, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction
1.7 Motion of Bodies, wedge friction, screw jack & differential screw jack

Unit 2: Basic Structural Analysis

2.1 Equilibrium in three dimensions; Simple Trusses
2.2 Method of Sections; Method of Joints
2.3 Beams & types of beams; Frames & Machines;
2.4 Centroid and Centre of Gravity, Centroid of simple figures from first principle
2.5 Centroid of composite sections;
2.6 Area moment of inertia- Definition, Moment of inertia of plane sections from first principles
2.7 Theorems of moment of inertia, Moment of inertia of standard sections and composite sections
2.8 Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

Unit 3: Virtual Work and Energy Method

3.1 Virtual displacements
3.2 Principle of virtual work for particle and ideal system of rigid bodies
3.3 Degrees of freedom

3.4 Active force diagram, systems with friction, mechanical efficiency
3.5 Conservative forces and potential energy (elastic and gravitational)
3.6 Energy equation for equilibrium
3.7 Applications of energy method for equilibrium; Stability of equilibrium.

PART-B

Unit 4: Review of particle dynamics
4.1 Rectilinear motion
4.2 Plane curvilinear motion (rectangular, path, and polar coordinates)
4.3 Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates)
4.4 Work-kinetic energy, power, potential energy
4.5 Impulse-momentum (linear, angular)
4.6 Impact (Direct and oblique)

Unit 5: Introduction to Kinetics of Rigid Bodies
5.1 Basic terms, general principles in dynamics
5.2 Types of motion, Instantaneous centre of rotation in plane motion and simple problems
5.3 D'Alembert's principle and its applications in plane motion and connected bodies
5.4 Work energy principle and its application in plane motion of connected bodies
5.5 Kinetics of rigid body rotation

Unit 6: Mechanical Vibrations
6.1 Basic terminology, free and forced vibrations
6.2 Resonance and its effects
6.3 Degree of freedom; single degree of freedom system
6.4 Derivation for frequency and amplitude of free vibrations without damping
6.5 Simple problems, types of pendulum, use of simple, compound and torsion pendulums.

Text/Reference Books:

1. I. H. Shames, 2006, Engineering Mechanics, 4th Edition, Prentice Hall.
2. F. P. Beer and E. R. Johnston, 2011, Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Edition, Tata McGraw Hill.
3. R. C. Hibbler, 2006, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. A.Ruina and Rudra Pratap, 2011, Introduction to Statics and Dynamics, Oxford University Press.
5. Shanes and Rao, 2006, Engineering Mechanics, Pearson Education.
6. Hibler and Gupta, 2010,Engineering Mechanics: Statics, Dynamics, Pearson Education.
7. Reddy Vijay Kumar K. and K. Suresh Kumar,2010, Singer's Engineering Mechanics.
8. R. K. Bansal, 2010, A Text Book of Engineering Mechanics, Laxmi Publications.
9. R.S. Khurmi, 2010, Engineering Mechanics, S. Chand & Co.
10. A.K. Tayal, 2010, Engineering Mechanics, Umesh Publications.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%

Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS - 302A)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-302A.1	3	3	2	2	2	-	-	-	1	1	-	3	3	2
BCE-DS-302A.2	3	3	2	2	2	-	-	-	1	1	-	3	2	3
BCE-DS-302A.3	3	3	2	2	2	-	-	-	1	1	-	3	2	3
BCE-DS-302A.4	3	3	2	2	2	-	-	-	1	1	-	3	2	3
BCE-DS-302A.5	3	3	2	2	2	2	-	-	1	1	-	3	3	3
BCE-DS-302A.6	3	3	3	2	2	3	3	3	3	3	3	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-303: DISASTER PREPAREDNESS & PLANNING

Credits 2	Max. Marks : 200
L-T-P 2-0-0	Continuous Evaluation : 100
Examination Duration 3 hrs	End Semester Exam : 100

Prerequisites: None
Course Type: Program Core

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

BCE-DS-303.1 Learn use of basic concepts of disaster management
BCE-DS-303.2 Interpret definitions and terminologies used in disaster management
BCE-DS-303.3 Relate to type and categories of disasters and their impacts
BCE-DS-303.4 Analyze relationship between development and disasters
BCE-DS-303.5 Correlate the challenges posed by various disasters
BCE-DS-303.6 Predict responsibility of stakeholders

PART-A

Unit 1: Introduction

1.1 Introduction - Concepts and definitions
1.2 disaster, hazard, vulnerability, risks severity
1.3 frequency and details, capacity, impact
1.4 prevention, mitigation.

Unit 2: Disaster Classification

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

Unit 3: Disaster Impacts

3.1 Disaster impacts (environmental, physical, social, ecological, economic, political, etc.);
3.2 health, psycho-social issues; demographic aspects (gender, age, special needs);
3.3 hazard locations; global and national disaster trends;
3.4 climate change and urban disasters.

PART-B

Unit 4: Disaster Risk Reduction (DRR)

4.1 Disaster management cycle – its phases;
4.2 prevention, mitigation, preparedness,
4.3 relief and recovery; structural and non-structural measures;
4.4 risk analysis, vulnerability and capacity assessment;
4.5 early warning systems,

4.6 Post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications)

Unit 5: Stakeholder Responsibility

5.1 Roles and responsibilities of government,

5.2 Community, local institutions, NGOs and other stakeholders;

5.3 Policies and legislation for disaster risk reduction,

5.4 DRRprogrammes in India and the activities of National Disaster Management Authority.

Unit-6: Disaster Vulnerability

6.1 Disasters, Environment and Development

6.2 Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.)

6.3 sustainable and environmental friendly recovery

6.4 reconstruction and development methods.

Text Books/ Reference Books:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. B.K. Singh, 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
3. G.K. Ghosh, 2006, Disaster Management, APH Publishing Corporation.
4. Disaster Medical Systems Guidelines, 2003, Emergency Medical Services Authority, State of California, EMSA no.214.
5. Inter Agency Standing Committee, 2007, IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings, Geneva.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

COURSE ATRICULATION MATRIX

CO Statement (BCE-DS-303)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-303.1	2	-	1	-	-	2	3	2	-	-	-	-	3	2
BCE-DS-303.2	-	1	-	-	-	-	2		-	-	-	-	2	3
BCE-DS-303.3	-	-	-	-	2	-	-	-	-	3	2	-	3	2
BCE-DS-303.4	-	-	-	2		-	-	3	2	3	-	-	3	3
BCE-DS-303.5	-	-	-	-	-	-	-	3	-	-	-	2	3	2
BCE-DS-303.6	2		1	-	-	2	3	2	-	-	-	-	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-305: ENGINEERING GEOLOGY

Credits 1		Max. Marks	: 200
L-T-P 1-0-0		Continuous Evaluation	: 100
Examination Duration 3hrs		End Semester Exam	: 100

Prerequisites: None Course Type: Program Core

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

BCE-DS-305.1. Relate to fundamentals of engineering geology
BCE-DS-305.2. Identify various rocks, its characterization and properties.
BCE-DS-305.3. Classify rocks, physical geology and their structure.
BCE-DS-305.4. Describe the features formed in rocks when subjected to stress.
BCE-DS-305.5. Distinguish hazards related to rock and associated structures.
BCE-DS-305.6. Develop an idea about rock mass as constructional and bearing material.

PART-A

Unit 1: Introduction

1.1 Branches of geology useful to civil engineering
1.2. Department dealing with this subject in India and their scope of work- as GSI
1.3 Interior of Earth- Core, Mantel and Crust.
1.4 Geological Time Scale, Indian Geology
1.5 Mineralogy- Mineral, Origin and composition, Physical properties of minerals, susceptibility of minerals to alteration, basic of optical mineralogy
1.6 Rock forming minerals, megascopic identification of common primary & secondary minerals, SEM, XRD.

Unit 2: Petrology

2.1 Rock forming processes. Specific gravity of rocks.
2.2 Igneous petrology
2.3 Sedimentary petrology
2.4 Metamorphic petrology

Unit 3: Physical Geology

3.1 Weathering, Erosion and Denudation.
3.2 Factors affecting weathering and product of weathering.
3.3 Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering, Alluvium, Glacial deposits, Laterite (engineering aspects), Desert Landform, Loess, Residual deposits of Clay with flints, mudflows, Coastal deposits
3.4 Soil and its formation, Soil type,

PART-B

Unit 4: Strength Behavior of Rocks

4.1 Stress and Strain in rocks.
4.2 Concept of Rock Deformation & Tectonics, Dip and Strike.
4.3 Outcrop and width of outcrop, Inliers and Outliers, Main types of discontinuities according to size.
4.4 Fold- Types and nomenclature, Criteria for their recognition in field.
4.5 Faults: Classification, recognition in field, effects on outcrops.
4.6 Joints & Unconformity; Types, Stresses responsible, geotechnical importance, Importance of structural elements in engineering operations.

Unit 5: Geological Hazards

5.1 Rock Instability and Slope movement.

5.2 Types of landslide. Prevention by surface drainage, slope reinforcement by Rock bolting and Rock anchoring, retaining wall, Slope treatment.

5.3 Ground water and factors controlling water bearing capacity of rock, Pervious & impervious rocks and ground water, Lowering of water table and Subsidence

5.4. Earthquake, its Magnitude and intensity

5.5 Consequences of failure as land sliding, Earthquake and Subsidence.

Unit-6: Rock masses as construction material & stability of foundation sites

6.1 Definition of Rock masses. Main features constituting rock mass. Main features that affects the quality of rock engineering and design.

6.2 Basic element and structures of rock those are relevant in civil engineering areas.

6.3 Main types of works connected to rocks and rock masses. Important variables influencing rock properties and behavior such as Fresh rock Influence from some minerals.

6.4 Geological conditions and their influence on the selection, location, type and design of dams & reservoirs

6.5 Geological conditions and their influence on the selection, location, type and design of tunnels & highways

Text Books/Reference Books:

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

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-305)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-305.1	3	2	2	1	1	1	3	1	-	-	1	2	1	-
BCE-DS-305.2	3	2	2	1	1	1	3	1	-	-	-	1	-	1

BCE-DS-305.3	3	1	2	1	-	2	1	1	2	-	-	-	-	-
BCE-DS-305.4	3	2	2	1	-	3	3	1	-	2	-	1	1	2
BCE-DS-305.5	3	2	2	1	-	1	3	1	-	-	-	2	-	-
BCE-DS-305.6	3	1	2	1	-	1	1	1	-	-	-	1	-	-

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BEC-DS-312: BASIC ELECTRONICS

Credits 1		Max. Marks	: 200
L-T-P 1-0-0		Continuous Evaluation	: 100
Examination Duration 3 hrs		End Semester Exam	: 100

Pre-requisites: Nil
Course Type: Engineering Science

Course Outcomes: At the end of this course, the student will be able to-
BEC-DS-312.1. Discuss the working & basic application of diode and transistor.
BEC-DS-312.2. Demonstrate the working of Field effect transistor.
BEC-DS-312.3. Analyze the concept of single stage amplifiers.
BEC-DS-312.4. Define and implement various topologies of feedback circuits.
BEC-DS-312.5. Understand the basic working principle of oscillator and designthe same.
BEC-DS-312.6. Communicate the learning for catering to professional ethics and societal needs.

PART-A

Unit 1: Diodes and Applications
1.1 Semiconductor Diode - Ideal versus Practical
1.2 Diode Equivalent Circuits, Diode as a Switch,
1.3 Diode as a Rectifier, Half Wave and Full Wave Rectifiers
1.4 Breakdown Mechanisms, Zener Diode – Operation and Applications
1.5 Construction, Operation and Applications of LEDs, Photo Diode Silicon Controlled Rectifier (SCR)

Unit 2: Transistor Characteristics
2.1 Construction, Operation, Amplifying Action
2.2 Common Base, Common Emitter and Common Collector Configurations
2.3 Field Effect Transistor (FET) – Construction, Characteristics of Junction FET
2.4 Classification, Small Signal Amplifiers – Basic Features
2.5 Common Emitter Amplifier, Coupling and Bypass Capacitors
2.6 Distortion, AC Equivalent Circuit

PART-B

Unit 3: Feedback Amplifiers
3.1 Principle, Advantages of Negative Feedback
3.2 Topologies
3.3 Oscillators – Classification
3.4 RC Phase Shift, Wien Bridge

Unit 4: Operational Amplifiers
4.1 Introduction to Op-Amp
4.2 Differential Amplifier Configurations, CMRR, PSRR, Slew Rate
4.3 Block Diagram, Pin Configuration of 741 Op-Amp
4.4 Characteristics of Ideal OpAmp
4.5 Concept of Virtual Ground

Text Books/Reference Books:
1. SantiramKal, 2002, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India.
2. T. L. Floyd and R. P. Jain, 2009, Digital Fundamentals, Pearson Education.

3. R. T. Paynter, 2009, Introductory Electronic Devices &Circuits, Conventional Flow Version, Pearson.
4.D. Neamen and D. Biswas, Semiconductor Physics and Devices, McGraw-Hill Education
5.S. M. Sze and K. N. Kwok, 2006, Physics of Semiconductor Devices, 3rd edition, John Wiley &Sons.
6.C.T. Sah, 1991, Fundamentals of Solid State Electronics, World Scientific Publishing Co. Inc.

Software Required/ Weblinks:
https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007
nptel.ac.in/courses/117103063/31
nptel.ac.in/courses/117103063/30

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BEC-DS-312)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
BEC-DS-312.1	3	3	2	2	2	-	-	-	-	-	-	2	1	-
BEC-DS-312.2	3	3	2	2	2	-	-	-	-	-	-	2	1	-
BEC-DS-312.3	3	3	3	2	2	-	-	-	-	-	-	2	1	-
BEC-DS-312.4	3	3	2	2	2	-	-	-	-	-	-	2	2	1
BEC-DS-312.5	3	3	2	2	2	-	-	-	-	-	-	2	2	1
BEC-DS-312.6	1	1	1	1	1	2	2	3	2	2	1	2	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
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BCE-DS-306: MATERIAL SCIENCE

Credits	1	Max. Marks	: 200
L-T-P	1-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Nil
Course Type: Engineering Science

Course Outcomes: At the end of this course, the student will be able to-

- BCE-DS-306.1. explain importance of materials in materials science and engineering field.
- BCE-DS-306.2. relate between material and engineering.
- BCE-DS-306.3. classify materials according to their types.
- BCE-DS-306.4. describe basic definition and conception of materials and physical properties of materials.
- BCE-DS-306.5. follow new developments in materials application field.

PART-A

Unit 1: Atomic structure and Bonding:
1.1 Electrons in atoms,
1.2 Bonding forces and energies,
1.3 Ionic bonding, Covalent Bonding,
1.4 Metallic Bonding, Secondary bonding.

Unit 2: Structure of Crystalline Solids:
2.1. Crystalline and non crystalline materials,
2.2. Crystal structures in metals and ceramics,
2.3. Miller indices

Unit 3: Imperfections in Solids:
3.1. Point defects,
3.2. Line defects and dislocations,
3.3. Interfacial defects,
3.4. Bulk or volume defects,
3.5. significance of defects in materials

PART-B

Unit 4: Diffusion in materials:
4.1. Diffusion mechanisms,
4.2. Steady and non-steady state diffusion,
4.3. Definitions and basic concepts,
4.4. Types of phase transformations,
4.5. Gibbs Phase Rule,
4.6. Interpretation of phase diagrams

Unit 5: Mechanical Properties of Materials:
5.1. Elastic deformation,
5.2. Plastic deformation,
5.3. Interpretation of tensile stress-strain curves,
5.4. Measurement of hardness in materials

Unit 6: Electrical Properties of Materials, Thermal Properties , Magnetic Properties, Optical Properties

6.1. Electrical conduction,
6.2. Dielectric Behaviour, Ferroelectric and Piezoelectric Behaviour
6.3. Heat capacity, Thermal stresses
6.4. Basic concepts, Diamagnetism,
6.5. Paramagnetism, Ferromagnetism, Antiferromagnetism, Ferrimagnetism,
6.6. Influence of temperature, Domains and Hysteresis
6.7. Optical properties of metals and non-metals

Text/Reference Books:

1. B. Robert, Metallic Materials Specification Handbook, Ros,
2. Katie Dicker, 2010, Science Detective Investigates: Materials
3. D.C. William, Materials Science and Engineering, Jr. Wiley India (P) Ltd.
4. H.A. Sidney, Introduction to Physical Metallurgy, Tata McGraw-Hill

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-306)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-306.1.	1	1	2	1	-	1	3	1	-	-	-	2	3	2
BCE-DS-306.2.	1	2	2	1	-	3	3	1	-	-	-	1	2	3
BCE-DS-306.3.	1	1	2	1	-	3	1	2	-	2	-	-	2	3
BCE-DS-306.4.	1	1	2	1	1	3	3	2	-	-	-	1	1	3
BCE-DS-306.5.	1	2	2	1	2	2	3	2	2	-	2	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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BCE-DS-403 SURVEYING & GEOMATICS

Credits 3	Max. Marks : 200
L-T-P 2-1-0	Continuous Evaluation : 100
Examination Duration 3 hrs	End Semester Exam : 100

Pre-requisites: None
Course Type: Program Core

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-403.1. Apply the basic Principles of surveying and leveling into related fields
BCE-DS-403.2. Use the concept of Triangulation and Trilateration to surveying
BCE-DS-403.3. Differentiate methods of analysis of various types of curves and its field applications
BCE-DS-403.4. Explain modern field survey systems with its basic principles
BCE-DS-403.5. Make use of Photogrammetry Surveying for photographic mapping
BCE-DS-403.6. Relate to the basic concepts and uses of Remote Sensing

PART-A

Unit 1: Introduction to Surveying
1.1 Principles, Linear, angular and graphical methods, Survey stations, Survey lines- ranging, Bearing of survey lines
1.2 Levelling: Plane table surveying, Principles of leveling, booking and reducing levels; differential, reciprocal leveling, profile levelling and cross sectioning
1.3 Digital and Auto Level, Errors in leveling
1.4 Contouring: Characteristics, methods, uses; areas and volumes

Unit 2: Triangulation and Trilateration
2.1 Theodolite survey: Instruments, Measurement of horizontal and vertical angle
2.2 Horizontal and vertical control, methods, triangulation, network Signals
2.3 Baseline, choices instruments and accessories, extension of base lines, corrections, Satellite station reduction to centre
2.4 Intervisibility of height and distances, Trigonometric leveling, Axis single corrections

Unit 3: Curves
3.1 Elements of simple and compound curves
3.2 Method of setting out, Elements of Reverse curve
3.3 Transition curve, length of curve, Elements of transition curve
3.4 Vertical curves

PART-B

Unit 4: Modern Field Survey Systems
4.1 Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments
4.2 Distomat, Total Station, Parts of a Total Station, Accessories, Advantages and Applications
4.3 Field Procedure for total station survey, Errors in Total Station Survey
4.4 Global Positioning Systems- Segments, GPS measurements, errors and biases
4.5 Surveying with GPS, Co-ordinate transformation, accuracy considerations

Unit 5: Photogrammetry Surveying

5.1 Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements
5.2 Terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping
5.3 Aerial triangulation, radial triangulation, methods; photographic mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes

Unit 6: Remote Sensing

6.1 Introduction Electromagnetic Spectrum
6.2 Interaction of electromagnetic radiation with the atmosphere and earth surface
6.3 Remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing

Text Books/ Reference Books:

1. N. Madhu, RSathikumar, and S. Gobi, 2006, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson, India.
2. Manoj, K. Arora and Badjatia, 2011,Geomatics Engineering, Nem Chand & Bros.
3. S.S. Bhavikatti, 2010,Surveying and Levelling, Vol. I and II, I.K. International.
4. A.M. Chandra, 2002, Higher Surveying, Third Edition, New Age International (P) Limited.
5. Anji Reddy, 2001, Remote sensing and Geographical information system, B.S. Publications.
6. K.R. Arora, 2015, Surveying, Vol-I, II and III, Standard Book House.

Software required/Weblinks:

https://nptel.ac.in/courses/105107122/1
https://nptel.ac.in/courses/105104101/
https://nptel.ac.in/syllabus/105104100/
https://nptel.ac.in/courses/105104100/43

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS 403)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-403.1	3	3	3	1	2	-	-	-	2	3	-	-	3	2
BCE-DS-403.2	3	3	3	3	2	-	-	-	3	3	2	-	3	3
BCE-DS-403.3	3	3	3	2	2	-	-	-	3	3	-	-	3	2
BCE-DS-403.4	3	3	3	2	2	-	-	-	2	2	2	2	3	3
BCE-DS-403.5	2	2	3	1	3	-	-	-	3	3	2	-	3	2
BCE-DS-403.6	2	2	3	3	3	-	-	-	3	3	3	2	2	3

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BCE-DS-351A: Computer-aided Civil Engineering Drawing Lab

PerioXX/week Credits | Max. Marks: 200
L: 0 P: 4 2 | Internal/Continuous Evaluation: 100
Duration of Examination: 3 Hrs | External/ End Semester Examination: 100

Pre-requisite: None
Course Type: Program Core

Course Outcomes: At the end of this course, the student will be able to-
BCE-DS-351A. 1Develop graphical skills for communicating concepts, ideas and designs of engineering products graphically/ visually.
BCE-DS-351A. 2 Interpret Parametric design and the conventions of formal engineering drawing
BCE-DS-351A. 3 Produce 2D & 3D drawings
BCE-DS-351A. 4 Examine a design critically and with understanding of CAD

List of Drawing Experiments:
1. Drafting a Plan of a typical residential building using Autocad
2. Taking standard drawings of a typical two storeyed building including all MEP, joinery, rebars, finishing and other details and writing out a description of the Facility in about 500 -700 words.
3. RCC framed structures
4. Reinforcement drawings for typical slabs, beams, columns and spread footings.
5. Industrial buildings - North light roof structures - Trusses
6. Perspective view of one and two storey buildings

Text/Reference Books:

1. Subhash C Sharma &Gurucharan Singh (2005), "Civil Engineering Drawing", Standard Publishers
2. Ajeet Singh (2002), "Working with AUTOCAD 2000 with updates on AUTOCAD 200I", Tata- Mc Graw-Hill Company Limited, New Delhi
3. Sham TickooSwapna D (2009), "AUTOCAD for Engineers and Designers", Pearson Education,
4. Venugopal (2007), "Engineering Drawing and Graphics + AUTOCAD", New Age International Pvt. Ltd.,
5. Balagopal and Prabhu (1987), "Building Drawing and Detailing", Spades publishing KDR building, Calicut,
6. (Corresponding set of) CAD Software Theory and User Manuals.
7. Malik R.S., Meo, G.S. (2009) Civil Engineering Drawing, Computech Publication Ltd New Asian.
8. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S.K.Kataria& Sons.

Assessment Tools:
Viva Voce
Lab Work
Lab Records

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	**60%**

File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Course Articulation Matrix

CO Statement (BCE-DS-351A)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-351A.1	1	1	2	1	-	1	3	1	-	-	-	2	3	2
BCE-DS-351A.2	1	2	2	1	-	3	3	1	-	-	-	1	2	3
BCE-DS-351A.3	1	1	2	1	2	3	1	2	2	2	-	-	2	3
BCE-DS-351A.4	1	1	2	1	-	3	3	2	-	-	1	1	1	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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BCE-DS-352: ENGINEERING GEOLOGY LAB

Credits 1		Max. Marks	: 100
L-T-P	0-0-2	Continuous Evaluation	: 50
Examination Duration	2 hrs	End Semester Exam	: 50

Co-requisite: Engineering Geology (BCE-DS-305)
Course Type: Program Core

Course Outcomes: At the end of this course, the student will be able to
BCE-DS-352.1. Correlate physical properties of minerals.
BCE-DS-352.2. Classify different group of minerals.
BCE-DS-352.3. Identify different minerals.
BCE-DS-352.4. Categorize identify different rocks
BCE-DS-352.5. Comprehend topographical maps.

List of Experiments:

1. Study of physical properties of minerals.
2. Study of different group of minerals.
3. Study of Crystal and Crystal system.
4. Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase; Cryptocrystalline group: Jasper; Carbonate group: Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
5. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite, Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.
6. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.
7. Identification of rocks (Metamorphic Petrolody): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
8. Study of topographical features from Geological maps. Identification of symbols in maps.

Text Books:

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

Instructions for Exam: Every student needs to complete 10 experiments in a semester. One experiment out of 10 given randomly needs to be performed in exams.

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Assessment Tools:
Viva Voce
Lab Work
Lab Records

Course Articulation Matrix

CO Statement (BCE-DS-352)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-352.1	1	2	2	3	-	3	3	2	1	1	-	1	1	-
BCE-DS-352.2	2	2	2	3	-	2	3	2	1	1	-	1	2	-
BCE-DS-352.3	2	2	2	3	1	3	3	2	1	1	-	1	2	-
BCE-DS-352.4	1	2	2	3	-	3	3	2	1	1	-	1	-	1
BCE-DS-352.5	2	2	2	3	-	2	3	2	1	1	-	1	1	-

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BCE-DS-453 SURVEYING & GEOMATICS LAB

Credits	1	Max. Marks	: 100
L-T-P	0-0-2	Continuous Evaluation	: 50
Examination Duration	2 hrs	End Semester Exam	: 50

Co-requisite: Surveying & Geomatics (BCE-DS-403)
Course Type: Program Core

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

BCE-DS-453.1. Use conventional surveying tools such as chain/tape, compass, plane table
BCE-DS-453.2. Demonstrate leveling to the field of civil engineering applications such as structural plotting, highway profiling and contouring
BCE-DS-453.3. Apply the procedures involved in field work and to work as a surveying team
BCE-DS-453.4. Take accurate linear and angular measurements
BCE-DS-453.5. Plot traverses to determine the location of points and coordinates present in the field.
BCE-DS-453.6. Make use of modern techniques and tools in the field of civil engineering applications such as plotting and measuring

List of Experiments:

1. Determination of area by chain & cross staff surveying.
2. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.
3. Fixing bench mark with respect to temporary bench mark with dumpy level by fly leveling and check levelling.
4. Profile levelling and plotting of L-Section and cross section of road.
5. Contouring and plotting
6. Measurement of angles using theodolite.
7. Measurement of vertical angles by tangential and stadia methods.
8. Method of plane table surveying
9. Setting out of Horizontal curve
10. Traversing with Total Station
11. Measure the coordinates by using hand GPS
12. GIS and Autocad plotting

Text Books/ Reference Books:

1. N. Madhu N, Sathikumar, R and Satheesh Gobi, 2006, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson, India.
2. S.S. Bhavikatti, 2010, Surveying and Levelling, Vol. I and II, I.K. International.
3. Anji M. Reddy, 2001, Remote sensing and Geographical information system, B.S. Publications.
4. K.R. Arora, 2015, Surveying, Vol-I, II and III, Standard Book House.
5. B.C. Punmia, Surveying Vol-I & II, Laxmi Publications (P) ltd.
6. S.K.Duggal, Surveying Vol-I & II, Tata McGraw Hill Pvt. Ltd.
7. James Anderson and Edward Mikhail, Surveying Theory and Practice, Mc Graw Hill.

Software required/Weblinks:

https://nptel.ac.in/courses/105107122/1
https://nptel.ac.in/courses/105104101/
https://nptel.ac.in/syllabus/105104100/
https://nptel.ac.in/courses/105104100/43

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Assessment Tools:

Assignments
Surprise questions during practical/Class Performance
End examination

Course Articulation Matrix

CO Statement (BCE-DS 453)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-453.1	3	3	3	1	2	-	-	-	2	3	-	-	3	2
BCE-DS-453.2	3	3	3	3	2	-	-	-	3	3	2	-	3	3
BCE-DS-453.3	3	3	3	2	2	-	-	-	3	3	-	-	3	2
BCE-DS-453.4	3	3	3	2	2	-	-	-	2	2	2	2	3	3
BCE-DS-453.5	2	2	3	1	3	**-**	**-**	**-**	3	3	2	-	3	2
BCE-DS-453.6	2	2	3	3	3	-	-	-	3	3	3	2	2	3

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NAAC 'A' Grade University

DTI -300: Design, Thinking and Innovation-I

Periods/week	Credits	Max. Marks	: 50
L:0 T:1 P:0	1	Continuous Assessment	: 50

Pre-requisites: Nil
Course Type: Research & Training
Course Coordinator: Mr. Yaman Hooda

Course Outcomes:
DTI 300.1. To explore different sources for generating ideas for Research.
DTI 300.2. To understand the problem classification based on domain specific resources.
DTI 300.3. To realize the design thinking stages.
DTI 300.4. To present critical analysis of literature survey.

Activity 1: Motivation
- 1.1 Divergent thinking and brain storming
- 1.2 Creative process

Activity 2: Introduction to Design Thinking
- 2.1 Empathize Mode
  - 2.1.1 Discussions and deliberations
- 2.2 Define Mode
- 2.3 Ideate Mode
  - 2.3.1 Contemporary Relevance.
  - 2.3.2 Tools and techniques for generating ideas
  - 2.3.3 Idea Challenges

Activity 3: Problem Classification
- 3.1 Domain Classification.
- 3.2 Identification of Mentors

Activity 4: Problem identification
- 4.1 Literature survey and option analysis.
- 4.2 Feasibility study.
- 4.3 Formulation of problem statement.
- 4.4 Expected Outcome / Model of the problem.
- 4.5 Planning Matrix

Activity 5: Presenting the Ideation
- 5.1 Structuring and preparation of PPT
- 5.2 Review on presentation skills and content delivered
- 5.3 Incorporating the review comments.

Course Articulation Matrix:

CO Statement (DTI-300)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
DTI 300.1	1	2	-	-	1	-	2	3	3	3	2	2	-	3
DTI 300.2	2	3	-	-	2	3	3	2	2	2	2	3	3	-
DTI 300.3	3	3	1	2	3	2	2	3	2	-	-	2	2	2
DTI 300.4	3	3	1	2	3	3	2	3	3	-	2	2	3	-

'3' (Tick) or 'More' Substantial/High Correlation, '2' Moderate/Medium Correlation, '1' Slightly/Low Correlation, 'Blank' No Correlation

Evaluation Criteria: The following evaluation parameters shall be considered for internal assessment by both research coordinators and faculty coordinator or research mentors:-

S. No:	Parameters	Description	Marks	
1.	**Attendance**	Percentage of classes attended by the students	**5**	**5**
2.	**Continuous Performance**	Group participation and response of the students to a given task:		**15**
		Judge individual student in the group	**5**	
		Meeting timelines as per activity plan	**10**	
3.	**Literature Review**	Student interaction with faculty mentors	**5**	**15**
		Relevance of the topic	**3**	
		Usage of Scientific Literature Databases. e.g., Scopus/ Web of Science/ etc.	**2**	
		Number of relevant papers / design referred for the given topic	**5**	
4.	**PPT & Report**	Report structure and Slide sequence	**5**	**15**
		Contribution of individual group member towards the presentation and report	**5**	
		Scientific/Technical writing	**5**	
		Max. Marks	**50**	**50**

References:

1. http://nptel.ac.in/courses/121106007/
2. http://public.wsu.edu/~taflinge/research.html

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BHM-MC-004: QUANTITATIVE APTITUDE

Credits	AP	Max. Marks	: 100
L-T-P	0-0-2	Continuous Evaluation	: 50
Examination Duration	2 hrs	End Semester Exam	: 50

Prerequisite: None
Course Type: HSMC

Course Outcomes: At the end of this course, the student will be able to
BHM-MC-004.1. Recognize problems based on arithmetic & number system.
BHM-MC-004.2. Solve problems based on verbal reasoning & simplification.
BHM-MC-004.3. Calculate the correct answers to the problems within given time.
BHM-MC-004.4. Plan their career meticulously by setting their time oriented goals.
BHM-MC-004.5. Introspect and enhance their personality.
BHM-MC-004.6. Develop cultural sensitivity and communicate respectfully across cultures.

PART-A

Unit 1: Number System 1

1.1 Vedic Mathematics
- 1.1.1 Basic of mathematics
- 1.1.2 Addition and subtraction using Vedic Mathematics
- 1.1.3 Multiplication of two and three numbers.

1.2 Simplification
- 1.2.1 BODMAS rule
- 1.2.2 Fractions and recurring decimals
- 1.2.3 Surds and indices

1.3 Numbers
- 1.3.1 Types of numbers and number tree
- 1.3.2 Divisibility Rule
- 1.3.3 HCF & LCM

Unit 2: Verbal Reasoning 1

2.1 Direction Sense Test
2.2 Blood Relation Test

Unit 3: Arithmetic 1

3.1 Problem on Ages
3.2 Problem on Numbers
3.3 Averages

PART- B

Unit 4: Career Planning

4.1 **Career planning Process** - Self Assessment, Research, Decision Making, Action and Employability
4.2 **Goal Setting:** Relevance, SMART goals, The Dos & Don'ts

Unit 5: Personality Enhancement

5.1 **Emotional Intelligence:** Emotional Self -Awareness, Self- Control, Emotional Management

5.2 **Stress Management:** What is Stress, Types of Stress, Stress Response Example, Vulnerability to Stress, Why do we Stress out, Stress Warning Symbols, Suggestions for Reducing Stress,

5.3 **Time Management:** Setting Priorities, Managing Time, Four Quadrants of Time Management

5.4. **Team Building:** Definition –Team, Characteristics of effective Teams, Competence, Clear and Compelling goal, Supportive Environment, Alignment, Designing the Team, Identifying Roles and Responsibilities, Determining Reward, Troubleshooting Guide, Good Team member

Unit 6: Effective Communication

6.1 **Courtesy in Communication:** Being Polite, Self -Discipline, Respecting Others and understanding other's perspective in communication

6.2 **Inter cultural Communication:** Breaking Stereotypes, Diversity Inclusion and Cultural Sensivity

Text Books/Reference Books:

1. R S Aggarwal, 2017, Quantitative Aptitude for Competitive Examinations, S Chand & Company Pvt Ltd.
2. R S Aggarwal, 2018, A Modern Approach to Verbal& Non Verbal Reasoning, S Chand & Company Pvt Ltd.
3. Mark A Griffin, College to Career: The Student Guide to Career and Life Navigation.
4. Anthony Gutierez, Effective Communication in the Workplace.

Instructions for paper setting: Fifty MCQ will be set in total. Twenty Five MCQ will be set from Part A and Twenty Five MCQ will be set from Part B. All questions will be compulsory. Each question will be of 1 mark. There will be no negative marking. Calculator will not be allowed.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS1	PS2
BHM-MC-004.1	1	-	-	2	-	-	-	-	-	-	-	-	-	1
BHM-MC-004.2	1	-	-	-	-	1	-	-	-	-	-	1	-	1
BHM-MC-004.3	1	-	-	1	-	-	-	-	-	-	-	-	-	-
BHM-MC-004.4	-	-	-	-	-	-	-	1	-	-	-	1	-	-
BHM-MC-004.5	-	-	-	-	-	-	-	1	3	3	-	1	-	2
BHM-MC-004.6	-	-	-	-	-	-	-	1	2	3	-	1	-	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A' Grade University

BHM-320: UNIVERSAL HUMAN VALUES

Periods/week Credits	Max. Marks	: 100
L: 1 T: 1 2	Continuous Evaluation	: 50
Duration of Examination: 2 Hrs	End Term Examination	: 50

Pre-requisite: None

Course Type: Humanities & Social Science

Course Outcomes: The course will enable the student to-

BHM-320.1. Develop a holistic perspective based on self-exploration aboutthemselves(humanbeing), family,societyandnature/existence.
BHM-320.2. Understand harmony in the human being,family,society and nature/existence

BHM-320.3. Strengthen the self-reflection, develop commitment and courage to act.

Unit 1: Course Introduction - Need, Basic Guidelines, Content and Process for ValueEducation(5 Lectures)

Purpose and motivation for the course,Self-Exploration–what is it? - Its content and process; 'Natural Acceptance'andExperiential Validation- astheprocessforself-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Rightunderstanding,RelationshipandPhysicalFacility- thebasic requirements for fulfillment of aspirations of every human being with their correctpriority, Understanding Happiness and Prosperity correctly- A critical appraisal of thecurrentscenario, Method to fulfill the above human aspirations: understanding and living inharmonyat variouslevels.

Unit2:UnderstandingHarmonyintheHumanBeing-HarmonyinMyself!(5 Lectures)

Understanding human being as a co-existence of the sentient 'I' and thematerial'Body' , Understanding the needs of Self ('I') and 'Body' - happiness and physicalfacility, Understanding the Body as an instrument of 'I' (I being the doer, seer andenjoyer),Understandingthecharacteristicsandactivitiesof 'I'andharmonyin'I', Understanding the harmony of I with the Body: Sanyam and Health; correctappraisalofPhysicalneeds,meaning ofProsperityindetail, ProgramstoensureSanyamandHealth.

Unit 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship(7 Lectures)

Understanding values in human-human relationship; meaning of Justice (nineuniversal values in relationships) and program for its fulfillment to ensure mutualhappiness;TrustandRespectasthefoundationalvaluesofrelationship, Understanding the meaning of Trust; Difference between intention andcompetence, Understanding the meaning of Respect, Difference between respect anddifferentiation;theother salient values inrelationship

Understanding the harmony in the society (society being an extension offamily): Resolution, Prosperity, fearlessness (trust) and co-existence ascomprehensive Human Goals,Visualizing a universal harmonious order in society- Undivided Society,Universal Order-from familyto worldfamily.

Unit 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence(6 Lectures)

UnderstandingtheharmonyintheNature, Interconnectedness and mutual fulfillment among the four orders of nature-recyclabilityand self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space Holisticperceptionofharmonyatalllevelsofexistence.
Include practice sessions to discuss human being as cause of imbalance innature (film "Home" can be used), pollution, depletion of resources and role oftechnology etc.

Unit 5: Implications of the above Holistic Understanding of Harmony onProfessionalEthics(5 Lectures)

Naturalacceptanceofhumanvalues, DefinitivenessofEthicalHumanConduct, Basis for Humanistic Education, Humanistic Constitution and HumanisticUniversal Order, Competence in professional ethics, Case studies of typical holistic technologies, management models andproductionsystems, Strategy for transition from the present state to Universal Human Order: a. Atthe level of individual: as socially and ecologically responsible engineers,technologists and managers b. At the level of society: as mutually enrichinginstitutionsand organizations,

Text and ReferenceBooks

1. R R Gaur, R Sangal, G P Bagaria, 2010, Human Values and Professional Ethics,Excel Books, New Delhi
2. A.N. Tripathi, 2019, Human Values, New age International Publishers.
3. E G Seebauer& Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.

Note:

Lecture's hours are to be used for interactive discussion, placing the proposalsabout the topics at hand and motivating students to reflect, explore and verifythem.

Tutorialhoursaretobeusedforpracticesessions.

Evaluation Tools:

Assessment by faculty mentor: 10 marksSelf-assessment:10marks

Assessmentbypeers:10marks

Socially relevant project/Group Activities/Assignments: 20 marks

SemesterEndExamination: 50 marks

Course articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
BHM-320.1	-	-	2	-	-	3	1	3	2	-	-	2
BHM-320.2	-	-	2	-	-	3	1	3	2	-	-	2
BHM-320.3	-	-	2	-	-	3	1	3	2	-	-	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A' Grade University

BHM-MC-002: SPORTS AND YOGA

Periods/week Credits	Max. Marks	: 100
L: 2 T: 0 AP	Continuous Evaluation	: 100

Duration of Examination: 1Hr

Pre-requisite: None

Course Type: Audit pass

Course Outcomes: The course will enable the student to-

BHM-MC-002.1. Understandtheimportanceofsoundhealthandfitnessprinciplesastheyrelate tobetterhealth.

BHM-MC-002.2.Participate in variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.

Unit 1: IntroductiontoPhysicalEducation, Wellness&Lifestyle(6 Lectures)

Meaning&definitionofPhysicalEducation, Aims&ObjectivesofPhysicalEducation,changingtrendsinPhysicalEducation, Meaning&ImportanceofPhysicalFitness&Wellness, ComponentsofPhysical fitness, Healthrelatedfitness and wellness, PreventingHealthThreatsthroughLifestyleChange, ConceptofPositive Lifestyle.

Unit 2: FundamentalsofAnatomy&PhysiologyinPhysicalEducation,Sports&Yoga(8 Lectures)

DefineAnatomy,Physiology&ItsImportance, EffectofexerciseonthefunctioningofVariousBodySystems (CirculatorySystem,RespiratorySystem,Neuro-MuscularSystemetc.), MeaningandConceptofPostures, CausesofBadPosture, Advantages&disadvantagesofweighttraining., Concept&advantagesofCorrectPosture, CommonPosturalDeformities–KnockKnee;FlatFoot;RoundShoulders;Lordosis, Kyphosis,BowLegs andScoliosis, CorrectiveMeasuresforPosturalDeformities.

Unit 3: Yoga&Lifestyle(6 Lectures)

ElementsofYoga,Introduction-Asanas,Pranayama,Meditation&YogicKriyas, Yogaforconcentration&relatedAsanas, RelaxationTechniquesforimprovingconcentration -Yog-nidra, Asanasaspreventivemeasures.

Unit 4: Training, Planning & PsychologyinSports(8 Lectures)

MeaningofTraining, warmingupandlimberingdown, Skill,Technique& Style, MeaningandObjectivesofPlanning, Tournament–Knock-Out,League/RoundRobin&Combination.

Definition&ImportanceofPsychologyinPhysicalEdu.&Sports, Define&DifferentiateBetweenGrowth&Development, AdolescentProblems&TheirManagement, Psychologicalbenefitsofexercise.

TextBooks/References:

1. Ajmer Singh and Rachhpal Singh Brar, 2019, Essentials ofPhysicalEducation, Kalyani Publishers.
2. B.K.S.Iyengar, 2015, Yoga for Sports, Westland publications.

Evaluation Tools:

Class Quiz, Rubrics

SEMESTER-IV

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-401 INTRODUCTION TO FLUID MECHANICS

Credits 2	Max. Marks : 200
L-T-P 2-0-0	Continuous Evaluation : 100
Examination Duration 3 hrs	End Semester Exam : 100

Pre-requisites: Engineering Mechanics (BCE-DS-302)
Course Type: Program Core

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

BCE-DS -401.1 Learn use of basic concepts of the properties of fluids and fluid statics
BCE-DS -401.2 Define terminologies used in equation of conservation of mass and its application.
BCE-DS -401.3 Relate to type and categories of kinematic problems such as finding particle paths and stream lines.
BCE-DS -401.4 Analyze relationship between continuity equation, Bernoulli's equation and turbulence, and apply the same to problems
BCE-DS -401.5 Interpret the laminar and turbulent flows
BCE-DS -401.6 Make use of Fluid Machinery and Open channel flow concepts to solve practical problems.

PART-A

Unit 1: Introduction to properties of fluid

1.1 Basic Concepts and Definitions – Distinction between a fluid and a solid, Density, Specific weight, Specific gravity.
1.2 Kinematic and dynamic viscosity, variation of viscosity with temperature.
1.3 Newton law of viscosity, vapour pressure, boiling point, cavitation.
1.4 Surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Unit 2: Fluid mechanics

2.1 Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude.
2.2 Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers.
2.3 Pressure gauges, Hydrostatic pressure and force, horizontal, vertical and inclined surfaces.
2.4 Buoyancy and stability of floating bodies.

Unit 3: Fluid Kinematics

3.1 Classification of fluid flow,steady and unsteady flow, uniformand non-uniform flow, laminar and turbulent flow, rotational and irrigational flow, compressible and incompressible flow, ideal and real fluid flow,
3.2 One-, two- and three-dimensional flows
3.3 Stream line, path line, streak line and stream tube
3.4 Stream function, velocity potential function.
3.5 One-, two- and three -dimensional continuity equations in Cartesian coordinates

PART-B

Unit 4: Fluid Dynamics

4.1Fluid Dynamics- Surface and body forces;
4.2 Equations of motion - Euler's equation
4.3 Bernoulli's equation – derivation
4.4 Energy Principle
4.5 Practical applications of Bernoulli's equation

Unit 5: Flow measurement

5.1 venturimeter – principle, illustration, derivation of discharge
5.2 orifice meter - principle, illustration, derivation of discharge
5.3 pitot tube- principle, illustration, derivation of discharge
5.2 Momentum principle; Forces exerted by fluid flow on pipe bend
5.3 Vortex Flow – Free and Forced

Unit 6 : Dimensional Analysis and Dynamic

6.1 Similitude - Definitions of Reynolds Number
6.2 Froude Number- derivation and its application
6.3 Mach Number- derivation and its application
6.4 Weber Number and Euler Number- derivation and its application
6.5 Buckingham's п-Theorem. -statemen , proof and application

Text/Reference Books:

1. C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, 2010, Fluid Mechanics and Machinery,Oxford University Press,
2. P M Modi and S M Seth, Hydraulics and Fluid Mechanics, Standard Book House
3. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill
4. R.L. Daugherty, J.B. Franzini and E.J. Finnemore, Fluid Mechanics with Engineering Applications, International Student Edition, Mc Graw Hill.

Software required / Web links

http://nptel.ac.in/courses/112105171/
http://nptel.ac.in/courses/112105183/
http://nptel.ac.in/courses/105101082/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests

Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-401)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-401.1	3	3	3	2	1	-	-	-	2	2	3	3	3	3
BCE-DS-401.2	3	3	3	3	1	-	-	-	2	2	3	3	3	3
BCE-DS-401.3	3	3	2	1	1	-	-	-	2	2	3	3	2	2
BCE-DS-401.4	3	3	1	2	2	-	-	-	2	3	3	3	2	2
BCE-DS-401.5	3	3	2	3	2	-	-	-	1	3	3	3	3	3
BCE-DS-401.6	3	3	3	2	3	-	-	-	3	3	3	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-402: INTRODUCTION TO SOLID MECHANICS

Credits	2	Max. Marks	: 200
L-T-P	2-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Engineering Mechanics (BCE-DS-302)
Course Type: Program Core

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

BEC-DS-402.1 Explain the concept of Stresses and Strain on various sections
BEC-DS-402.2 Utilise the concept of Bending Moment and shear force for various types of loading and sections
BEC-DS-402.3 Analyze the concept of flexural stresses on various sections
BEC-DS-402.4 Deduce the concept of Shear Stresses in different sections
BEC-DS-402.5 Apply the concept of Torsions in various types of sections
BEC-DS-402.6 Measure hoop stresses and longitudinal stresses in Thin Cylinders

PART-A

Unit 1: Stress and Strain

1.1 Concept of stress and strain, St. Venant's principle, stress and strain diagram
1.2 Elasticity and plasticity – Types of stresses and strains, Hooke's law, stress – strain diagram for mild steel – Working stress – Factor of safety
1.3 Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses.
1.4 Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications. Compound Stresses and Strains- Two dimensional system, stress at a point on a plane,
1.5 Principal Stresses and Principal Planes, Mohr Circle Of Stress, Ellipse Of Stress And Their Applications.
1.6 Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between different elastic constants.

Unit 2: Bending moment and Shear Force

2.1 Bending moment and Shear Force Diagrams
2.2 BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs.
2.3 Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span
2.4 Combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

Unit 3: Flexural Stresses

3.1 Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation
3.2 Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and hollow),
3.3 I, T, Angle and Channel sections – Design of simple beam sections.
3.4 Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

Unit 4: Shear Stresses

4.1 Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections
4.2 rectangular and circular sections
4.3 Triangular, I, T angle sections.

Unit 5: Torsions

5.1 Torsion- Derivation of torsion equation and its assumptions
5.2 Applications of the equation of the hollow and solid circular shafts, torsional rigidity
5.3 Combined torsion and bending of circular shafts
5.4 Principal stress and maximum shear stresses under combined loading of bending and torsion.
5.5 Analysis of close-coiled-helical springs.

Unit 6: Thin Cylinders

6.1 Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress
6.2 Longitudinal stress in a cylinder, and sphere subjected to internal pressures.

Text Books/ Reference Books:

1. S. Timoshenko and D.H. Young, Elements of Strength of Materials, DVNC, New York, USA.
2. S. M. A. Kazmi,Solid Mechanics, TMH, Delhi, India.
3. R. C. Hibbeler, 2004, Mechanics of Materials., 6th ed., Rutherford, NJ: Pearson Prentice Hall.
4. S. H. Crandall, N. C. Dahl, and T. J. Lardner., 1979, An Introduction to the Mechanics of Solids, 2nd ed, McGraw Hill, New York.
5. William Kendrick Hall, Laboratory Manual of Testing Materials.
6. P. Beer Ferdinand, E. Russel Jhonston Jr., John T. DEwolf, 2002,Mechanics of Materials, TMH.
7. R. Subramanian, Strength of Materials, Oxford University Press, New Delhi.

Software required/Weblinks:

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BEC-DS-402)	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BEC-DS-402.1	1	2	3	2	3	-	-	-	-	-	-	2	3	2
BEC-DS-402.2	2	3	3	2	1	-	-	-	-	-	-	2	3	2
BEC-DS-402.3	3	3	3	2	2	-	-	-	-	-	-	2	3	2
BEC-DS-402.4	3	3	3	2	2	-	-	-	-	-	-	2	3	1
BEC-DS-402.5	3	3	3	3	3	-	-	-	-	-	-	2	3	2
BEC-DS-402.6	2	1	1	1	2	3	3	3	3	3	3	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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BCE-DS-404A: MATERIALS, TESTING & EVALUATION

Credits	2	Max. Marks	: 200
L-T-P	1-1-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: None
Course Type: Program Core

BCE-DS-404A.1. Describe the properties and applications of different construction materials
BCE-DS-404A.2. Apply the knowledge of different materials to real life problems
BCE-DS-404A.3 Analyze the mechanical behavior of materials
BCE-DS-404A.4. Interpret the test result
BCE-DS-404A.5. Compare the applicability of civil engineering materials in varying situations
BCE-DS-404A.6. Recommend usage of appropriate construction materials with due consideration of sustainability

PART-A

Unit 1: Introduction to Engineering Materials

1.1 Introduction
1.2 Choosing Materials for Construction
1.3 Physical Properties, Mechanical Properties, Thermal Properties and Other Properties
1.4 Sustainable Materials

Unit 2: Civil Engineering Materials
2.1 Stones, Bricks
2.2 Cements
2.3 Ceramics, and Refractories
2.4 Bitumen and asphaltic materials
2.5 Structural Steel and other Metals

Unit 3: Composite and Smart Materials
3.1 Concrete (plain, reinforced and steel fibre/ glass fibre-reinforced, light-weight concrete, High Performance Concrete, Polymer Concrete)
3.2 Carbon Fiber Reinforced concrete
3.3 Nanomaterials
3.4 Shape-Memory, 3D Printing of Materials

PART-B
Unit 4: Deformation and Fracture of Materials
4.1 Introduction
4.2 Types of Material Failures: Elastic and Plastic Deformation, Tension Tests, Bending Test, Torsion Test Quasi-brittle Fracture
4.3 Creep Deformation
4.4 Fatigue under Cyclic Loading
4.5 Background to Fracture Mechanics

Unit 5: Testing and Evaluation of Materials
5.1 Sampling and Testing of Cement
5.2 Field Tests on Cement

5.3 Chemical Tests on Cement
5.4 Tests for Aggregates
5.5 Tests for Mortars
5.6 Tests on Fresh and Hardened Concrete
5.7 Tests for Mortars

Unit 6: Non Destructive Testing
6.1 Rebound Hammer Test
6.2 Ultrasonic Pulse Velocity Test
6.3 Impact-echo Test
6.4 Permeability Test

Text Books/ Reference Books:

1. R. Chudley and Greeno, 2006,
 Handbook, 6th ed., R. Butterworth-Heinemann.
2. S.K. Khanna, C.E.G Justo and A Veeraragavan, Highway Materials and Pavement Testing, 5th ed., Nem Chand& Bros.
3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications.
4. Kyriakos Komvopoulos, 2011, Mechanical Testing of Engineering Materials, Cognella.
5. E.N. Dowling 1993, Mechanical Behaviour of Materials, International Edition, Prentice Hall.
6. American Society for Testing and Materials (ASTM), 2000, *Annual Book of ASTM Standards*
7. Related papers published in international journals

Software required/Weblinks:

https://nptel.ac.in/
https://swayam.gov.in/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-404A)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
BCE-DS-404A.1	3	3	3	3	2	-	-	-	-	1	1	2	3	2

BCE-DS-404A.2	3	2	-	3	2	-	-	3	-	-	0	2	2	2
BCE-DS-404A.3	3	-	1	2	2		-	3	-	-		2	3	2
BCE-DS-404A.4	3	3	3	2	2	2	-	-	-	1	1	2	2	1
BCE-DS-404A.5	3	3	3	3	3	-	1	1	2	1	1	2	3	2
BCE-DS-404A.6	1	1	1	1	2	3	2	3	3	3	3	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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BCE-DS-405: ENERGY SCIENCE & ENGINEERING

Credits	2	Max. Marks	: 200
L-T-P	1-1-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: None
Course Type: ESC

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

BCE-DS-405.1. Describe concept of energy systems and renewable energy resources,
BCE-DS-405.2. Relate to the concept of sustainability
BCE-DS-405.3. Explore society's present needs and future energy demands,
BCE-DS-405.4. Evaluate carbon footprints due to contemporary techno processes
BCE-DS-405.5. Design various civil engineering systems/ projects dealing with energy generation paradigms in an efficient manner.
BCE-DS-405.6. Organize information on renewable energy technologies as a basis for further analysis and evaluation

PART-A

Unit 1: Introduction to Energy Science:

1.1 Scientific principles and historical interpretation to place energy use in the context of pressing societal
1.2 Environmental and climate issues; Introduction to energy systems and resources;
1.3 Introduction to Energy, sustainability & the environment

Unit 2: Energy Sources:

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

Unit 3: Energy & Environment

3.1 Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development
3.2 Carbon footprint, energy consumption and sustainability
3.3 introduction to the economics of energy- production and consumption; linkages between economic and environmental outcomes
3.4 future energy impact on economic, environmental, trade, and research policy.

PART-B

Unit 4: Civil Engineering Projects connected with the Energy Sources

4.1 Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines
4.2 Solar chimney project, wave energy caissons
4.3 Coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.
4.4 Nuclear reactor containment buildings and associated buildings

Unit 5: Design and Construction

5.1. Constraints and testing procedures for reactor containment buildings

5.2. Spent Nuclear fuel storage and disposal systems

5.3. Energy Audit of Facilities and optimization of energy consumption

Unit 6: Engineering for Energy conservation

6.1 Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located

6.2 LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates

Text Books/ Reference Books:

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

Software required/Weblinks:

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-405)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-405.1	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-405.2	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-405.3	3	3	3	2	2	-	-	-	-	-	-	2	3	2
BCE-DS-405.4	3	3	3	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-405.5	3	3	3	3	3	-	-	-	-	-	-	2	3	2
BCE-DS-405.6	1	1	1	1	2	3	3	3	3	3	3	2	2	3

BCE-DS-407: BUILDING CONSTRUCTION

Credits 2		Max. Marks	: 200
L-T-P 1-1-0		Continuous Evaluation	: 100
Examination Duration 3 hrs		End Semester Exam	: 100

Prerequisite: None

Course Outcomes: On completion of the course, the students will be able

BCE-DS-407.1. To visualize different components of building construction.
BCE-DS-407.2. To describe the constructional detailing of different building components.
BCE-DS-407.3. To signify various building and general construction products
and their associated quality, durability, warrantees, and availability.
BCE-DS-407.4. To relate to classical development of Civil Engineering from past to present.
BCE-DS-407.5. To implement the sustainability parameters in building construction.

PART- A

Unit-I: Masonry Construction

1.1 Types of buildings, components of a building, design loads
1.2 Introduction to various terms used
1.3 Stone masonry-Dressing of stones, Classifications of stone masonry, safe permissible loads
1.4 Brick masonry-bonds in brick work, laying brick work, structural brick work-cavity and hollow walls, reinforced brick work, Defects in brick masonry, composite stone and brick masonry
1.5 Composite masonry

Unit-II: Load Bearing and Partition Walls

2.1 Concept of framed structures
2.2 Classification of walls – load bearing, non-load bearing, dwarf wall, retaining, breast walls and partition walls
2.3 Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls
2.4 Partition walls: Constructional details, suitability and uses of brick and wooden partition walls

Unit-III: Foundation

3.1 Introduction & Functions of Foundation
3.2 Types of shallow foundations, general feature of shallow foundation, design of masonry wall foundation
3.3 Sub-surface investigations, geophysical methods
3.4 Foundations in water logged areas
3.5 Introduction to deep foundations i.e. pile and pier foundations

PART- B

Unit-IV: Arches and Lintels

4.1 Types of Arches and various terms used in arches and lintels
4.2 Stone arches and their construction
4.3 Brick arches and their construction
4.4 Purpose of lintel & materials used in Lintels

4.5 Cast-in-situ and pre-cast lintels
4.6 Lintel along with sun-shade or chhajja

Unit V: Roofs and Floors
5.1 Types of roofs
5.2 Various terms used
5.3 Roof trusses-king post truss, queen post truss etc.
5.4 Floor structures, ground, basement and upper floors, various types of floorings

Unit-VI: Green Buildings
6.1 Importance
6.2 components: Site, Rain water harvesting/water efficiency, energy efficiency, material efficiency
6.3 Indoor air quality design and innovation rating system
6.4 Sustainability in construction methods
6.5 Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings
6.6 Construction of insulating, fire-resistant buildings

Text Books:

1. IS:1905-1987 "Code of Practice for Structural use of Unreinforced Masonry"
2. Sushil Kumar "Building Construction", Firewall Media
3. Rangawala,"Engineering Materials" Charotar Publications

Reference Books:

1. A.W. Hendry, F.M.Khalaf, "Masonry Wall Construction"
2. A.W. Hendry, B.P.Sinha, S.R.Davies , "Design of Masonry Structures",
3. Francis D.K.Ching, " Building Construction Illustrated",John Wiley & Sons
4. Robin Barry, " Construction of Buildings",Wiley-Blackwell Publications
5. Roy Chudley, Building Construction Handbook,Routledge
6. M.M. Goyal, "Handbook of BUILDING CONSTRUCTION (Vol-1): The Essential Source of Standard Const. Practices", Hard Back

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Software required / Web links

http://nptel.ac.in/courses/

http://nptel.ac.in/courses/

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-407)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-407.1	3	3	-	1	2	-	2	-	-	3	-	2	3	1
BCE-DS-407.2	3	-	2	1	2	-	-	3	-	-	-	-	-	1
BCE-DS-407.3	-	-	-	1	2	2	-	-	-	2	-	3	3	1
BCE-DS-407.4	3	3	2	1	2	-	3	-	2	-	-	3	-	1
BCE-DS-407.5	1	-	-	1	2	2	2	3	2	2	1	-	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-406: TRANSPORTATION ENGINEERING

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: None
Course Type: Program Core

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-406.1. Make use of surveys involved in planning and highway alignment.
BCE-DS-406.2. Discuss the geometric elements of highways and expressways.
BCE-DS-406.3. Classify various properties of pavement materials and their testing procedures.
BCE-DS-406.4. Design flexible and rigid pavement as per IRC guidelines.
BCE-DS-406.5. Survey the traffic studies in real life situations
BCE-DS-406.6. Implement traffic regulation and control measures and intersection design.

PART-A

Unit 1: Highway development and planning
1.1 Classification of roads
1.2 Road development in India
1.3 Current road projects in India
1.4 Highway alignment and project preparation

Unit 2: Geometric design of highways
2.1 Introduction
2.2 Highway cross section elements
2.3 Sight distance
2.4 Design of horizontal alignment
2.5 Design of vertical alignment
2.6 Design of intersections, problems

Unit 3: Traffic engineering & control
3.1 Traffic Characteristics
3.2 Traffic engineering studies
3.3 Traffic flow and capacity
3.4 Traffic regulation and control
3.5 Design of road intersections
3.6 Design of parking facilities
3.7 Highway lighting; problems

PART-B

Unit 4: Pavement materials
4.1 Soils, Stone aggregates
4.2 Bituminous binders, bituminous paving mixes
4.3 Portland cement: desirable properties, tests
4.4 Requirements for different types of pavements
4.5 Cement concrete: desirable properties, tests, Problems

Unit 5: Design of flexible pavement
5.1 Introduction
5.2 Flexible pavements
5.3 Factors affecting design and performance
5.4 Stresses in flexible pavements
5.5 Design of flexible pavements as per IRC, problems

Unit 6: Design of rigid pavement
6.1 Components and functions
6.2 Factors affecting design and performance of CC pavements
6.3 Stresses in rigid pavements
6.4 Design of concrete pavements as per IRC; problems

Text Books/ Reference Books:

1. S.K Khanna, C.E.G Justo and A Veeraragavan, 2017, Highway Engineering, revised 10th Edition, Nem Chand & Bros.
2. L.R Kadiyalai, Traffic Engineering and Transport Planning, Khanna Publishers.
3. ParthaChakraborty, Principles of Transportation Engineering, PHI Learning, AICTE Model Curriculum for Undergraduate degree in Civil Engineering (Engineering & Technology)
4. Fred L. Mannering, Scott S. Washburn and Walter P. Kilareski, Principles of Highway Engineering and Traffic Analysis, 4th Edition, John Wiley.
5. Srinivasa Kumar R, 2011, Textbook of Highway Engineering, Universities Press.
6. Paul H. Wright and Karen K. Dixon, 2009, Highway Engineering, 7th Edition, Wiley Student Edition.

Software required/Weblinks:
https://nptel.ac.in/downloads/105101087/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-406)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-406.1.	1	3	3	3	3	2	3	2	2	2	2	2	3	2
BCE-DS-406.2.	3	3	3	3	3	-	2	1	-	1	3	2	3	2
BCE-DS-406.3.	3	3	3	2	2	1	2	1	2	2	2	2	3	2
BCE-DS-406.4.	1	2	3	3	-	2	2	-	-	-	-	-	3	2
BCE-DS-406.5.	3	3	3	3	3	-	2	-	2	-	-	2	3	2
BCE-DS-406.6.	3	3	3	3	3	-	2	-	2	-	-	2	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-451-INTRODUCTION TO FLUID MECHANICS LAB

Credits 1		Max. Marks	: 100
L-T-P	0-0-2	Continuous Evaluation	: 50
Examination Duration	2 hrs	End Semester Exam	: 50

Co-requisites: Introduction to Fluid Mechanics (BCE-DS-401)
Course Type: Program Core

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

BCE-DS -451.1	Learn use of basic concepts for Measurement of viscosity and Pressure Measuring Devices
BCE-DS -451.2	Define terminologies used in derive expression of metacentric height, its measurement and hydrostatic pressure
BCE-DS -451.3	Evaluate head and discharge at different section
BCE-DS -451.4	Analyze concepts of jet and its applications
BCE-DS -451.5	Relate ideal flow to real flow
BCE-DS -451.6	Measure velocity in laminar flow

PART-A

Lab Experiments

1. Measurement of viscosity
2. Study of Pressure Measuring Devices
3. Stability of Floating Body
4. Hydrostatics Force on Flat Surfaces/Curved Surfaces
5. Verification of Bernoulli's Theorem
6. Venturimeter
7. Orifice meter
8. Impacts of jets
9. Flow Visualization -Ideal Flow
10. Length of establishment of flow
11. Velocity distribution in pipes
12. Laminar Flow

Text/Reference Books:

1. C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli,2010, Fluid Mechanics and Machinery, Oxford University Press.
2. P M Modi and S M Seth, Hydraulics and Fluid Mechanics, Standard Book House.
3. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill.
4. R.L. Daugherty, J.B. Franzini and E.J. Finnemore, Fluid Mechanics with Engineering Applications, International Student Edition, Mc Graw Hill.

Software required / Web links

http://nptel.ac.in/courses/112105171/
http://nptel.ac.in/courses/112105183/
http://nptel.ac.in/courses/105101082/

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C-451.1	3	3	3	3	3	-	-	-	2	3	3	3	3	3
C-451.2	3	3	3	3	3	-	-	1	2	2	2	1	2	2
C-451.3	3	3	3	3	3	-	-	1	3	3	3	3	2	2
C-451.4	3	3	3	3	3	-	-	1	3	3	3	3	2	2
C-451.5	3	2	2	2	1	--	-	-	3	2	2	3	2	2
C-451.6	3	3	3	3	3	-	-	-	1	3	3	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-452: SOLID MECHANICS LAB

Credits	1	Max. Marks	: 100
L-T-P	0-0-2	Continuous Evaluation	: 50
Examination Duration	2 hrs	End Semester Exam	: 50

Co-requisites: Introduction to Solid Mechanics (BCE-DS-402)
Course Type: Program Core

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-452.1. Distinguish material properties and material testing apparatus.
BCE-DS-452.2. Decide appropriate material in design
BCE-DS-452.3. Explain Bending Moment and Shear forces in beams
BCE-DS-452.4. Describe Strain in a bar
BCE-DS-452.5 Apply the concept of deflection in beams

List of Experiments:

1 Tension test
2 Bending tests on simply supported beam and Cantilever beam
3 Compression test on concrete
4 Impact test
5 Shear test
6 Investigation of Hook's law that is the proportional relation between force and Stretching in elastic deformation,
7 Determination of torsion and deflection
8 Measurement of forces on supports in statically determinate beam
9 Determination of shear forces in beams
10 Determination of bending moments in beams
11 Measurement of deflections in statically determinate beam
12 Measurement of strain in a bar
13 Bend test steel bar
14 Yield/tensile strength of steel bar

Text Books:

1. George Earl Troxell, Harmer Elmer Davis, An Introduction to the Making and Testing of Plain Concrete: A Text and Laboratory Manual, Stanford University Press.
2. C.B.Kukreja and V.V.Sastry, Experimental Methods in Structural Mechanics, Standard publishers.

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

Assessment Tools:
Lab work
Lab file
Viva
Internal exam
Semester end examination

Course Articulation Matrix

CO Statement (BCE-DS-452)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
BCE-DS-452.1	3	3	2	3	3	1	2	-	3	1	2	1	3	3
BCE-DS-452.2	3	3	2	3	3	1	2	-	3	1	2	1	3	3
BCE-DS-452.3	3	3	2	3	3	1	2	-	3	1	-	1	3	3
BCE-DS-452.4	3	3	2	3	3	1	2	-	3	1	-	1	3	3
BCE-DS-452.5	3	3	2	3	3	1	2	-	3	1	2	1	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-454: MATERIALS, TESTING & EVALUATION LAB

Credits 1	Max. Marks : 100
L-T-P 0-0-2	Continuous Evaluation : 50
Examination Duration 2 hrs	End Semester Exam : 50

Co-requisite: Materials, Testing & Evaluation (BCE-DS-404)
Course Type: Program Core

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

BCE-DS-454.1. Relate to measurements of behavior of various materials used in Civil Engineering
BCE-DS-454.2. Demonstrate basics physical observations to complement concepts learnt
BCE-DS-454.3. Apply the experimental procedures and common measurement instruments, Equipment and devices
BCE-DS-454.4. Describe established material testing procedures and techniques
BCE-DS-454.5. Analyze mechanical and structural properties of materials

List of Experiments:

1. Gradation of coarse and fine aggregates
2. Different corresponding tests and need/application of these tests in design and quality control
3. Tensile Strength of materials & concrete composites
4. Compressive strength test on aggregates
5. Tension I - Elastic Behaviour of metals & materials
6. Tension II - Failure of Common Materials
7. Direct Shear - Frictional Behaviour
8. Concrete I - Early Age Properties
9. Concrete II - Compression and Indirect Tension
10. Compression – Directionality
11. Soil Classification
12. Consolidation and Strength Tests
13. Tension III - Heat Treatment
14. Torsion test
15. Hardness tests (Brinnel's and Rockwell)
16. Tests on closely coiled and open coiled springs
17. Theories of Failure and Corroboration with Experiments
18. Tests on unmodified bitumen and modified binders with polymers
19. Bituminous Mix Design and Tests on bituminous mixes - Marshall method
20. Concrete Mix Design as per BIS

Text Books/ Reference Books:

1. R. Chudley and Green, 2006, Building Construction Handbook 6th ed. ,R. Butterworth-Heinemann.
2. S.K. Khanna, C.E.G Justo and A Veeraragavan , Highway Materials and Pavement Testing, Nem Chand & Bros, Fifth Edition.
3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications
4. Kyriakos Komvopoulos 2011, Mechanical Testing of Engineering Materials, Cognella.

5. E.N. Dowling 1993, Mechanical Behaviour of Materials, Prentice Hall International Edition.
6. American Society for Testing and Materials (ASTM), *Annual Book of ASTM Standards* (post 2000).
7. Related papers published in international journals.

Software required/Weblinks:
https://nptel.ac.in/courses/105/104/105104030/
https://nptel.ac.in/courses/105102088/
https://nptel.ac.in/courses/105106053/

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Assessment Tools:
Assignments
Surprise questions during practical/Class Performance
End examination

Course Articulation Matrix

CO Statement (BCE-DS 454)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-454.1	3	3	3	2	-	2	1	-	2	3	-	3	1	3
BCE-DS-454.2	3	3	3	3	-	2	3	-	3	3	2	3	2	3
BCE-DS-454.3	3	3	3	2	-	2	2	-	3	3	-	3	1	3
BCE-DS-454.4	3	3	3	2	-	2	2	-	2	2	2	2	2	3
BCE-DS-454.5	2	2	3	2	-	3	1	-	3	3	2	3	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-455: TRANSPORTATION ENGINEERING LAB

Credits 1		Max. Marks	: 100
L-T-P	0-0-2	Continuous Evaluation	: 50
Examination Duration	2 hrs	End Semester Exam	: 50

Co-requisites: Transportation Engineering (BCE-DS-406)
Course Type: Program Core

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-455.1. Relate to measurements of behavior of various materials used in road construction
BCE-DS-455.2. Demonstrate use of basics properties to complement concepts learnt
BCE-DS-455.3. Apply the experimental procedures to real life highway engineering problems
BCE-DS-455.4. Describe established material testing procedures
BCE-DS-455.5. Analyze application of appropriate materials in highway construction

List of Experiments:
1. Aggregate Impact test.
2. Los-Angeles Abrasion test of Aggregate.
3. Soundness test of Aggregate.
4. Crushing strength test of Aggregate.
5. Aggregate shape test.
6. Specific Gravity of Aggregate.
7. Softening point test of Bitumen.
8. Ductility test of Bitumen.
9. Penetration test of Bitumen.
10. Flash and Fire point test of Bitumen.

Reference Books
Khanna & Justo, Highway Engg, New Chand & Bros.

Software required / Web links
http://te.iitd.ac.in/
http://nptel.ac.in/courses/105105107/
http://nptel.ac.in/downloads/105101087/

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

Assessment Tools:
Viva voce
Lab demonstrations
Surprise questions during labs/Class Performance

End Semester Practical Exam

Course Articulation Matrix

CO Statement (BCE-DS-455)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-455.1.	-	1	1	1	1	2	1	-	-	-	-	2	3	2
BCE-DS-455.2.	3	2	2	3	2	2	3	1	3	3	2	2	3	2
BCE-DS-455.3.	1	2	2	2	2	2	3	1	2	2	2	2	3	2
BCE-DS-455.4.	1	2	2	2	2	2	3	1	-	1	2	2	3	2
BCE-DS-455.5.	-	2	3	2	2	2	2	1	2	2	2	2	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A' Grade University

DTI - 400: Design, Thinking and Innovation -II

Periods/week	Credits	Max. Marks	: 50
L:0 T:1 P:0	1	Continuous Assessment	: 50

Pre-requisites: Design, Thinking and Innovation -I
Course Type: Research & Training
Course Coordinator: Mr. Yaman Hooda

Course Outcomes:

DTI 400.1. To understand the research methodologies/approaches/techniques used in the literature
DTI 400.2. To formulate the experimental procedures / algorithms based on research methodology
DTI 400.3. To develop prototype by experiment / simulation.
DTI 400.4. To analyze the recorded data / output.

Activity 1: Methodology Study & Matrix design.

1.1. Analysis of different approach/methodology adopted by various researchers
1.2. Comparative analysis
1.3. Prospective Design.

Activity 2: Design of experiments

2.1 Finalization of experimental procedure / algorithm design.
2.2 Procurement of materials / Hardware and Software.
2.3. Develop experimental setup / design

Activity 3: Execution of experiments/simulations

3.1. Conduct experiments / build prototype.
3.2. Modification of the experimental set-up / algorithm.

Activity 4:

4.1 Tabulating and analyzing data / output.
4.2 Assessment of the output with earlier published work / product
4.3 Interpretation and presentation of the results / outcome.

Course Articulation Matrix:

CO Statement (XX-400)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
DTI -400.1	3	-	-	2	3	3	-	2	1	-	-	-	1	-
DTI -400.2	3	3	-	3	3	2	1	3	2	-	3	1	3	2
DTI -400.3	3	-	2	2	2	-	3	3	3	3	3	2	3	3
DTI -400.4	3	3	2	1	2	2	2	-	2	2	2	2	3	2

'3' (Tick) or 'More' Substantial/High Correlation, '2' Moderate/Medium Correlation, '1' Slightly/Low Correlation, 'Blank' No Correlation

Evaluation Criteria: The following evaluation parameters shall be considered for internal assessment by both research coordinators and faculty coordinator or research mentors:-

S. No.	Parameters	Description	
1.	**Attendance**	• Percentage of classes attended by the students	**5**
2.	**Continuous Performance**	Group participation and response of the students to a given task: • Judge individual student in the group • Meeting timelines as per lesson plan	**15**
3.	**Experimental Setup / Design**	• Assessment of experimental set up / design • Evaluation of result / outcome. • Validation of results. • Novelty / Relevance of work.	**20**
4.	**Structuring and presentation**	• Structuring and presentation • Group presentation with individual contribution	**10**

References:

1. http://www.sciencedirect.com/
2. https://www.ncbi.nlm.nih.gov/pubmed
3. https://www.elsevier.com/books-and-journals
4. https://www.plos.org/
5. https://www.deepdyve.com/
6. http://ieeexplore.ieee.org/Xplore/home.jsp
7. https://www.researchgate.net/
8. https://www.science.gov/
9. https://scholar.google.co.in/
10. http://www.popsci.com/

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BHM-MC-006: Quantitative Aptitude and Personality Development-I

Periods/week	Credits	Max. Marks	: 100
P :2	AP	Continuous Evaluation	: 50
Duration of Examination: 2 Hrs		End Sem Exam	: 50

Pre-Requisite: Basic Knowledge of English
Course Type: HSMC

Course Outcomes: Students will be able to-
BHM-MC-006.1. Recognize & solve problems based on non-verbal reasoning.
BHM-MC-006.2. Solve complex problems based on arithmetic reasoning.
BHM-MC-006.3. Apply short tricks on complex problems of verbal reasoning.
BHM-MC-006.4. Apply correct usage of grammar in communication.
BHM-MC-006.5. Enhance their vocabulary and use it in day to day life.
BHM-MC-006.6. Develop speed reading & writing skills.

PART-A

Unit 1: Arithmetic II
- 1.1 Percentages
- 1.2 Ratio & Proportion
  - 1.2.1. Proportionality
  - 1.2.2. Variations
  - 1.2.3. Partnership
- 1.3 Profit & Loss
  - 1.3.1. Basic terminology & Formulae
  - 1.3.2. Error in Weights
  - 1.3.3. Marked Price and Discounts
- 1.4 Time & Work
  - 1.4.1. Time and Work, Chain Rule
  - 1.4.1. Work & Wages
  - 1.4.2. Pipes & Cisterns
- 1.5 Mixtures & Alligations

Unit 2: Verbal Reasoning 2
- 2.1 Syllogism
- 2.2 Ranking
- 2.3 Coding-Decoding
- 2.4 Inequalities and Mathematical Operations

Unit 3: Non Verbal Reasoning
- 3.1 Pictorial Series
- 3.2 Missing Values
- 3.3 Analogy and Images

Part-B

Unit 4: Communication Accuracy
- 4.1 Relevance of Verbal Ability and preparatory guidelines
- 4.2 Functional Grammar – Subject Verb Agreement
- 4.3 Tenses – Perfect, Simple, Continuous
- 4.4 Common Errors and rectification

Unit 5: Word Power Building Skills

5.1 Words: Antonyms, Synonyms, Verbal Analogies
5.2 Compound words: Homophones, Homonyms, Word Families
5.3 Root Word Technique for Prefixes & Suffixes
5.4: Word Power: 7 Tips for Learning New Words
5.5 Practice Vocabulary Exercises

Unit 6: Reading & Writing Skills

6.1 Objectives of Reading, Definition & Types of Reading & Importance of Reading
6.2 Reading Techniques: SW3R, Active Reading, Detailed, Speed
6.3 Practice Exercises: Short & Medium Passages3.1 Writing: Introduction of Writing Skills, Objectives of enhancing Writing Skills & Types of Writing
6.4 Sentences, Phrases, Types of Sentences, Parts of Sentences
6.5 Paragraph Writing: Construction, Linkage & Cohesion

Text Books/Reference Books:

1. R S Aggarwal, 2017, Quantitative Aptitude for Competitive Examinations, S Chand & Company PvtLtd.
2. R S Aggarwal, 2018, A Modern Approach to Verbal& Non Verbal Reasoning, S Chand & Company Pvt Ltd.
3. Verbal Ability and Reading Comprehension: MVN Enterprises
4. P.A. Anand, Verbal Ability and Reasoning for Competitive Examinations, Wiley

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix:

CO Statement (BHM-MC-006)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
BHM-MC-006.1	1	-	-	-	-	1	-	-	-	-	-	1	-	-
BHM-MC-006.2	1	-	-	2	-	-	-	-	-	-	-	-	-	-
BHM-MC-006.3	1	-	-	-	-	1	-	-	-	-	-	1	-	-
BHM-MC-006.4	1	-	-	1	-	-	-	-	1	3	-	2	1	1
BHM-MC-006.5	1	-	-	1	-	1	-	-	1	3	-	2	-	-
BHM-MC-006.6	1	2	-	1	1	1	1	1	1	3	1	2	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-421: Smart Materials

PerioXX/week Credits	Max. Marks: 200
L: 3 T:0 3	Internal/Continuous Evaluation: 100
Duration of Examination: 3 Hrs	External/ End Semester Examination: 100

Pre-requisites: None
Course Type: Program Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-421.1: identify various smart materials on different patterns
BCE-DS-421.2: Classify various Sensors and sensing technologies
BCE-DS-421.3: Recommend actuator Techniques to be used
BCE-DS-421.4: apply methods for data Acquisition

PART-A

Unit 1: Introduction about Smart Materials
1.1. Introduction to Smart Materials and Structures
1.2. Instrumented structures functions and response
1.3. Sensing systems
1.4. Self –diagnosis
1.5. Signal processing consideration
1.6. Actuation systems and effectors.

Unit 2: Measuring techniques
2.1. Strain Measuring Techniques using Electrical strain gauges
2.2. Types
2.3. Resistance
2.4. Capacitance
2.5. Inductance
2.6. Wheatstone bridges
2.7. Pressure transducers
2.8. Load cells
2.9. Temperature Compensation

Unit 3: Sensing Technology
3.1. Sensing Technology
3.2. Types of Sensors
3.3. Physical Measurement using Piezo Electric Strain measurement
3.4. Inductively Read Transducers
3.5. The LVDT
3.6. Fiber optic Techniques.

PART-B

Unit 4: Structural Assessments
4.1. Chemical sensing in structural Assessment
4.2. Bio-Chemical sensing in structural Assessment

4.2. Absorptive chemical sensors
4.3. Spectroscopes
4.4. Fibre Optic Chemical Sensing Systems and Distributed measurement.

Unit 5: Actuator Techniques
5.1. Actuator Techniques
5.2. Actuator and actuator materials
5.3. Piezoelectric and Electrostrictive Material
5.4. Magneto structure Material
5.5. Shape Memory Alloys
5.6. Electro rheological fluids
5.7. Electromagnetic actuation
5.8. Role of actuators and Actuator Materials.

Unit 6: Data Acquisition and Processing
6.1. Data Acquisition and Processing
6.2. Signal Processing and Control for Smart Structures
6.3. Sensors as Geometrical Processors
6.4. Signal Processing
6.5. Control System: Linear and Non-Linear.

Text Books/ Reference Books:

1. Srinivasan, A. V. and Michael McFarland, D., "Smart Structures: Analysis and Design", Cambridge University Press, 2009.
2. Michelle Addington and Daniel L. Schodek, "Smart Materials and Technologies: For the Architecture and Design Professions", Routledge 2004.
3. Brain Culshaw, "Smart Structure and Materials", Artech House – Borton. London,1996.
4. L. S. Srinath, "Experimental Stress Analysis", Tata McGraw-Hill, 1998.
5. J. W. Dally and W. F. Riley, "Experimental Stress Analysis", Tata McGraw-Hill, 1998.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-421)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
BCE-DS-421.1	2	3	3	3	2	-	-	-	-	1	1	2	3	2
BCE-DS-421.2	3	2	-	3	2	-	-	3	-	-	0	2	2	2
BCE-DS-421.3	3	-	1	3	3		-	3	-	-		2	3	2
BCE-DS-421.4	3	3	3	2	2	2	-	-	-	1	1	2	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-422: Introduction to Sustainable Development

PerioXX/week Credits	Max. Marks: 200
L:3 T: 0 3	Internal/Continuous Evaluation: 100
Duration of Examination: 3 Hrs	External/ End Semester Examination: 100

Pre-requisites: None
Course Type: Program Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-422.1: have an increased awareness among students on issues in areas of sustainability.
BCE-DS-422.2: understand the role of engineering and technology within sustainable development.
BCE-DS-422.3: know the methods, tools, and incentives for sustainable product-service system development
BCE-DS-422.4: establish a clear understanding of the role and impact of various aspects of engineering and engineering decisions on environmental, societal, and economic problems

Part A

Unit 1: Sustainability- need and concept
Sustainability- need and concept, challenges, Environment acts and protocols,.

Unit 2: Global, Regional and Local environmental issues
Global, Regional and Local environmental issues, Natural resources and their pollution, Carbon credits,
Unit 3: Zero waste concept
Zero waste concept ISO 14000, Life Cycle Analysis, Environmental Impact Assessment studies,

Part B

Unit 4: Sustainable habitat
Sustainable habitat, Green buildings, green materials, Energy,

Unit 5: Conventional and renewable sources
Conventional and renewable sources, Technology and sustainable development,

Unit 6: Sustainable urbanization, Industrial Ecology.
Sustainable urbanization, Industrial Ecology.

Reference:

1. Edwards, Andres R.; Orr, David W., The sustainability revolution: portrait of a paradigm shift, Gabriola Island, B.C.: New Society, 2005

2. Blyton, Paul.; Franklin, Alex., Researching sustainability: a guide to social science methods, practice and engagement, London: Earthscan, 2011.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-422)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
BCE-DS-422.1	2	3	3	3	2	-	-	-	-	1	1	2	3	2
BCE-DS-422.2	3	2	-	3	2	-	-	3	-	-	0	2	2	2
BCE-DS-422.3	3	-	1	3	3		-	3	-	-		2	3	2
BCE-DS-422.4	3	3	3	2	2	2	-	-	-	1	1	2	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-423: Transformation to Green Buildings

PerioXX/week Credits	Max. Marks: 200
L: 3 T: 0 3	Internal/Continuous Evaluation: 100
Duration of Examination: 3 Hrs	External/ End Semester Examination: 100

Pre-requisites: None
Course Type: Program Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-423.1: Explain the principles of building planning, its bylaws and provide facilities for rainwater harvesting.
BCE-DS-423.2: Understand the concepts of green buildings
BCE-DS-423.3: Acquire knowledge on various aspects of green buildings
BCE-DS-423.4: Learn the principles of planning and orientation of buildings

Part A

Unit 1: INTRODUCTION

A historical perspective. General premises and strategies for sustainable and green design, objectives and basis.

Unit 2: GREEN CONSTRUCTION AND ENVIRONMENTAL QUALITY

Sustainable architecture and Green Building: Definition, Green building evaluation systems; Renewable Energy; Controlling the water cycle, Impact of materials on environment;

Unit 3: PASSIVE DESIGN IN MATERIALS

Passive Design and Material Choice – Traditional Building Materials – Importance of envelope material in internal temperature control – Specification for walls and roofs in different climate – Material and Humidity Control.,

Part B

Unit 4: ECO HOUSE

The form of the house, the building as an analogy. Building concepts: energy loss, insulation, passive solar gain, active solar gain, health benefits, sustainable materials.

Unit 5: SUSTAINABLE AND GREEN BUILDING DESIGN STUDIO

This studio will explore collaborative learning to explore, investigate and apply various parameters of sustainability for design development of projected building/ urban scenarios

Unit 6: INDOOR ENVIRONMENTAL.

Indoor Environmental Quality for Occupant Comfort and Wellbeing: Daylighting, air ventilation, exhaust systems, low VOC paints, materials & adhesives, building acoustics. Codes related to green buildings: NBC, ECBC, ASHRAE, UPC etc.

Reference:

1. Mili Majumdar, "Energy-efficient buildings in India" Tata Energy Research Institute, 2002.
2. TERI "Sustainable Building Design Manual- Volume I & II" Tata Energy Research Institute, 2009.
3. Shahane, V. S, "Planning and Designing Building", Poona, Allies Book Stall, 2004.
4. Michael Bauer, Peter Mösle and Michael Schwarz "Green Building – Guidebook for Sustainable Architecture" Springer, 2010.
5. Tom Woolley, Sam Kimmins, Paul Harrison and Rob Harrison "Green Building Handbook" Volume I, Spon Press, 2001.
6. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
7. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.
8. Alternative building materials and technologies by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao
9. Non-Conventional Energy Resources by G. D. Rai, Khanna Publishers.
10. Sustainable Building Design Manual, Vol.1 and 2, TERI, New Delhi 2004.
11. Mike Montoya, Green Building Fundamentals, Pearson, USA, 2010.
12. Charles J. Kibert, Sustainable Construction – Green Building Design and Delivery, John Wiley &Sons, New York, 2008.
13. Regina Leffers, Sustainable Construction and Design, Pearson / Prentice Hall, USA, 2009.
14. Ken Yeang: Eco Design- A manual for Ecological design; Wiley Academy, 2006.
15. Sue Roaf et all: Ecohouse, A design guide; Elsevier Architectural Press, 2007.
16. Thomas E Glavinich: Green Building Construction; Wiley, 2008.
17. Brenda and Robert Vale: Green Architecture, Design for a Sustainable Future; Thames and Hudson, 1996.
18. Daniel Vallero and Chris Brasier: Sustainable Design - The science of sustainability and Green Engineering; Wiley, 2008

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-423)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
BCE-DS-423.1	2	3	3	3	2	-	-	-	-	1	1	2	3	2
BCE-DS-423.2	3	2	-	3	2	-	-	3	-	-	0	2	2	2
BCE-DS-423.3	3	-	1	3	3		-	3	-	-		2	3	2
BCE-DS-423.4	3	3	3	2	2	2	-	-	-	1	1	2	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-424: Introduction to Smart Cities

Periods/week Credits **Max. Marks: 200**
L: 3 T: 0 3 **Internal/Continuous Assessment: 100**
Duration of Examination: 3 Hrs **End Semester Exam : 100**

Pre-requisites: None
Course Type: Program Elective

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

BCE-DS-424.1 Describe the concept of Smart Cities with different approaches
BCE-DS-424.2 Classify the utilities of energy in Urban cities
BCE-DS-424.3 Deduce the Smart transportation system and other challenges in developing Smart cities
BCE-DS-424.4 Explore IOT and its application in smart cities

PART A

Unit 1: Smart Urban Infrastructures and Smart Cities

1.1 Introduction about Smart Cities and urban planning
1.2 Smart Cities Applications and related Technologies
1.3 Perspective on Smart Cities
1.4 Smart Cities success factors and opportunities
Unit 2: Smart Urban Energy System
2.1 Energy Consumption and Utilities
2.2 Urban Energy System
2.3 Energy efficiency in buildings
2.4 Policies and Managerial requirements
2.5 Procedures for energy measurement
2.6 Energy monitoring Techniques
Unit 3: Smart Urban Transport System
3.1 Introduction to Intelligent Transportation
3.2 Smart Urban Transportation
3.3 Challenges in implementation and Expenditure

PART B

Unit 4: Introduction to Internet of Things (IoT)

4.1 Concept of Internet of Things
4.2 Big Data for IoT
4.3 Smart Sensors, process units and actuators
4.4 Artificial Intelligence
Unit 5: Smart Cities Innovations and Challenges
5.1 Challenges on Services
5.2 Challenges on Infrastructures
5.3 Challenges in Managers
5.4 Challenges for policy makers
Unit 6: Smart City Case Study
6.1 Baltimore, MD, USA
6.2 Shangai, China
6.3 Dunedin, New Zealand

6.4 Singapore
6.5 Toronto, Canada

Text Books/Reference Books:

1. N. Mani, 2016, Smart Cities & Urban Development in India, John Willey & Sons.
2. S. Jeschke,R. Srivasan , 2017, Smart Cities: Foundations, Principles, and Applications, Oxford press.
3. Alan R. Shark , Sylviane Toporkoff, Sebastien Levy, 2014, Smart Cities for a Bright Sustainable Future: A Global Perspective, 2014
4. Ejaz, Waleed, Anpalagan, Alagan, 2019, Internet of Things for Smart Cities: Technologies, Big Data and Security, Springer International Publishing

Software required / Web links:
https://www.youtube.com/watch?v=d7xgXsQmPZE
https://freevideolectures.com/course/4638/nptel-introduction-internet-things/48

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (**BCE-DS-424**)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BCE-DS-424 .1	3	3	2	1	3	2	1	1	1	1	1	2	3	3
BCE-DS-424.2	3	3	2	1	3	2	1	1	1	1	1	2	3	3
BCE-DS-424.3	3	3	2	1	3	2	1	1	1	1	1	2	3	3
BCE-DS-424.4	3	3	2	1	3	2	1	1	1	1	1	2	3	3

SEMESTER-V

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

PROJ-CE-500: SUMMER INTERNSHIP-II

Credits 2 Max. Marks : 100
Practical/Week 4-6 weeks Continuous Evaluation : 100

Prerequisites: None
Course Type: Project Work

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

PROJ-CE-500.1. Identify various civil related to relevant field
PROJ-CE-500.2. Explore the various possibilities of a career in this field.
PROJ-CE-500.3. Demonstrate competency in relevant engineering fields through problem identification, formulation
PROJ-CE-500.4. Generate a report-based project/ experience carried out
PROJ-CE-500.5. Develop the professional and ethical responsibilities of an engineer.

Every student will have to undergo 60 Hours Summer Internship over a period of 04 weeks in the field/ Civil Engineering Department Labs. Head of Department will approve the Industry/Organization for Onsite training. During this course of time, he/she will be regularly monitored and evaluated. On the completion of training duration, he/she will have to submit the training report, deliver presentation about the work/project undertaken during the training.

The parameters for evaluation during the training shall be as under:

Presentation/Viva:	40 Marks
Training Report:	20 Marks
Performance:	20 marks
Attendance:	20 Marks

	100

ARTICULATION MATRIX

CO Statement (PROJ-CE-500)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
PROJ-CE-500.1	1	2	3	3	1	-	-	-	2	-	-	-	-	2
PROJ-CE-500.2	2	1	-	-	-	1	1	-	2	2	2	-	2	2
PROJ-CE-500.3	2	-	-	3	-	-	1	1	1	-	-	-	1	2
PROJ-CE-500.4	2	2	2	2	1	2	-	2	2	-	-	1	1	2
PROJ-CE-500.5	2	2	2	2	1	1	-	2	1	3	2	2	-	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-502: GEOTECHNICAL ENGINEERING

Credits	2	Max. Marks	: 200
L-T-P	2-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: None
Course Type: Program Core

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-502.1. Classify soil according to their properties
BCE-DS-502.2. Summarize knowledge about seepage and stresses of soil
BCE-DS-502.3. Apply methods to find out the stresses, bearing pressure and contact pressure.
BCE-DS-502.4. Make use of compaction and field control of soil compaction with different method.
BCE-DS-502.5. Explain concept of consolidation and settlement
BCE-DS-502.6. Analyze shear strength parameters and inherent properties of soil

PART-A

Unit 1: Introduction

1.1 Types of soils, their formation and deposition, Scope of soil engineering. Comparison and difference between soil and rock.
1.2 Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio, and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity, etc. Relationship between volume weight, voids ratio-moisture content, unit weight- percent air voids, saturation- moisture content, moisture content-specific gravity etc.,
1.3 Plasticity of soil, consistency limits, consistency indices, flow & toughness indices, definitions of activity and sensitivity
1.4 Classification of Soils-

Unit 2: Permeability of Soil and effective stresses

2.1 Darcy's law, validity of Darcy's law.
2.2 Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping- in test, pumping- out test.
2.3 Permeability aspects: permeability of stratified soils, factors affecting permeability of soil.
2.4 Stream and potential functions, characteristics of flow nets, graphical method to plot flow nets,
2.5 Effective stress principle, nature of effective stress, effect of water table. Fluctuations of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.

Unit 3: Compaction and Soil Exploration

3.1 Introduction, theory of compaction,
3.2 Laboratory determination of optimum moisture content and maximum dry density.
3.3 Compaction in field, compaction specifications and field control,
3.4 Methods of site exploration and soil investigation, methods of boring, soil samplers, sampling procedures, trail pits, borings, penetrometer tests, analysis of borehole logs, geophysical and advance soil exploration methods.

PART-B

Unit 4: Stresses in Soil

4.1 Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area.
4.2 Influence factors, Isobars, Boussinesq's equation, Newmark's Influence Chart.
4.3 Contact pressure under rigid and flexible area,
4.4 Computation of displacements from elastic theory.

Unit 5: Consolidation of Soil

5.1 Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation,
5.2 Spring analogy for primary consolidation,
5.3 Interpretation of consolidation test results,
5.4 Terzaghi's theory of consolidation, final settlement of soil deposits,
5.5 Computation of consolidation settlement and secondary consolidation.

Unit 6: Shear Strength

6.1 Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses,
6.2 Mohr-Coulomb theory,
6.3 Types of shear tests: direct shear test, merits of direct shear test,
6.4 Triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement,
6.5 Computation of effective shear strength parameters. unconfined compression test, vane shear test

Text Books/ Reference Books:

1. Gopal Ranjan , Basic and Applied Soil Mechanics, New Age International
2. Alam Singh, Soil Mechanics, Asia Publishing House
3. K.R.Arora, Soil Mech& Foundation Engineering, Standard Publisher
4. B.C.Punmia, Soil Mech& Foundation Engineering,Fireball Media

Software required/Weblinks:

http://nptel.ac.in/courses/ 105103097 /

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-502)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-502.1	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-502.2	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-502.3	3	3	3	2	2	-	-	-	-	-	-	2	3	2
BCE-DS-502.4	3	3	3	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-502.5	3	3	3	3	3	-	-	-	-	-	-	2	3	2
BCE-DS-502.6	1	2	1	1	2	3	3	3	3	3	3	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-503A: STRUCTURAL ENGINEERING

Credits	2	Max. Marks	: 200
L-T-P	1-1-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Engineering Mechanics for Civil Engineers (BCE-DS-302)
Course Type: Program Core

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-503.1. Apply the basics of structural analysis and principles of engineering mechanics.
BCE-DS-503.2. Analyze the concepts of Loads, material strength and factor of safety
BCE-DS-503.3. Comprehend the criteria of design of structural elements
BCE-DS-503.4. Make use of codal provisions in design
BCE-DS-503.5. Design real life structural elements
BCE-DS-503.6. Appraise design of pre-stressed structural elements vs RCC

PART-A

Unit 1: Introduction
1.1 Principles of Stability, Equilibrium
1.2 Structural Types
1.3 Structural components
1.4 Load Transfer Path
1.5 Roles of structural engineer, architect and builders in a construction project
1.6 Different stakeholders in a construction project

Unit 2: Materials and Loads
2.1 Planning and Design Process
2.2 Different types of Materials
2.3 Loads – Live Load, Dead Load, Wind Loads, Earthquake Loads and Snow load with relevant Codes
2.4 Load Combinations
2.5 Behavior and Properties of Concrete and Steel

Unit 3: Structural Design Criteria
3.1 Introduction to the analysis and design of structural systems.
3.2 Design philosophies for structural engineering.
3.3 Laboratory experiments dealing with the analysis of determinate and indeterminate structures;
3.4 Behaviour of Different structural Elements under loads
3.5 Safety Factors

PART-B

Unit 4: Design of Steel Structures
4.1 Common Steel Structures and their components
4.2 Types of Steel, Properties, Rolled Sections
4.3 Special Consideration in Steel Design
4.4 Limit States – Collapse and Serviceability
4.5 Types of Connections

4.6 Codal Provisions

Unit 5: Design of Reinforced Concrete Structures

5.1 Working Stress Method
5.2 Limit State Method
5.3 Concepts of under and over Reinforced Sections
5.4 Simple Analysis and Design Problem
5.5 Concepts of Shear, Development Length, Torsion

Unit 6: Prestressed Concrete

6.1. Basic Concepts
6.2. Classification and types of Prestressing
6.3. Prestressing Systems
6.4. Losses of Prestress
6.5. Analysis based on stress concepts
6.6. Discussion on Type-I, Type-II and Type-III Members

Text Books/ Reference Books:

1. A. H. Nilson, 2004 Design of Concrete Structures. 13th edition. McGraw Hill,
2. J.C McCormac, J.K. Jr Nelson,2003 Structural Steel Design.. Prentice Hall, 3rd edition
3. T.V. Galambos, , F.J. Lin, and B.G Johnston,1996 Basic Steel Design with LRFD, Prentice Hall,
4. W. T. Segui, LRFD Steel Design, PWS Publishing, Boston. 2nd Ed.
5. C.G Salmon, and J.E. Johnson, 1990, Steel Structures: Design and Behavior, Harper & Row, Publishers, New York, 3rd Edition.
6. J. G MacGregor,1997 Reinforced Concrete: Mechanics and Design, Prentice Hall, New Jersey, 3rd Edition
7. E. G. Nawy, Reinforced Concrete: A Fundamental Approach, Prentice Hall, New Jersey, 5th Edition
8. C.K. Wang and C. G Salmon, Reinforced Concrete Design, Addison Wesley, New York, 6th Edition
9. E. G. Nawy, ,2003 Prestressed Concrete: A Fundamental Approach, Prentice Hall, NJ,
10. Related Codes of Practice of BIS
11. Smith, J. C., Structural Analysis, Harpor and Row, Publishers, New York.
12. W. McGuire, R. H. Gallagher and R. D. Ziemian, 2000, Matrix Structural Analysis, John Wiley and Sons, 2nd Edition,
13. NBC, National Building Code, BIS (2017).
14. ASCE,2002 Minimum Design Loads for Buildings and Other Structures, ASCE 7-02, American Society of Civil Engineers, Virginia

Software required/Weblinks:

https://nptel.ac.in/
https://swayam.gov.in/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-503A)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2
BCE-DS-503A.1	3	3	3	3	2	-	-	2	-	-	1	2	1	2
BCE-DS-503A.2	3	2	-	3	2	-	3	1	3	-	1	2	3	2
BCE-DS-503A.3	3	-	-	2	2	2	3	3	2	-	-	2	3	2
BCE-DS-503A.4	3	2	3	2	2	-	-	-	-	1	-	2	3	1
BCE-DS-503A.5	3	3	3	3	3	-	-	-	-	1	-	2	3	2
BCE-DS-503A.6	1	1	1	1	2	3	2	3	3	3	3	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE–DS–505A: Structural Analysis - I

Credits	2	Max. Marks	200
L-T-P	1-0-2	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Examination	100

Pre-requisites: None
Course Type: Program Core

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS -505A.1 Derive the shear and bending moment equations for idealized structures to draw the shearing force and bending moment diagrams.
BCE-DS -505A.2 Calculate the internal forces in beams, frames, cable and arch type modelled real structures
BCE-DS -505A.3 Deduce the influence lines for reactions, shears, and bending moments in beams and girders due to moving load.
BCE-DS -505A.4 Apply the methods to calculate slope and deflection as well as force and moments in statically indeterminate structures for serviceability criteria Model structural systems (bridge and building) with the aid of Staad Pro software.

Part A

Unit 1: Review of basic concepts
1.1 Equilibrium
1.2 Stability and Static Determinacy of structures
1.3 Shear force and bending moment diagram in beams and frames
1.4 Verify BMD and SFD by Staad Pro.

Unit 2: Analysis of statically determinate structures
2.1 Plane truss: method of joints and method of sections
2.2 Three Hinged Arch
2.3 Euler's theory of Columns
2.4 Concept of Influence line diagram and moving loads
2.5 Verify Axial force in truss by Staad Pro

Unit 3: Analysis of statically determinate structures.
3.1 Strain Energy and Energy Theorems
3.2 Deflection of truss: Method of virtual work
3.3 Deflection of beams and frames-Moment area method, conjugate beam method and virtual work method
3.4 Verify deflected profile with Staad Pro.

PART-B

Unit 4: Analysis of statically indeterminate structures
4.1 Propped Cantilever
4.2 Fixed beams
4.3 Continuous beams
4.4 Verify deflected profile with Staad Pro.

Unit 5: Introduction to direct stiffness method

5.1 Kinematic Indeterminacy
5.2 Beams and Frames: Moment distribution method
5.3 Beams and Frames: Slope deflection method
5.4 Verify slope value by Staad Pro.

Unit 6: **Suspension Bridges and Cable structures**
6.1 Equilibrium of light cables
6.2 Analysis of Cables
6.3 Temperature stresses
6.4 Three hinged stiffening girders
6.5 Two Hinged stiffening girders
6.6 Analysis for temperature in Staad Pro

Text/Reference Books:

1. Vazirani&Ratwani et al , "Analysis of Structures" Vol 1, Khanna Publishers
2. Bhavikatti, "Structural Analysis" Vol I Vikas Publishers
3. Hibbler , "Structural Analysis", Pearson Education.
4. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill.
5. S.B.Junnarkar, Dr. H. J. Shah "MECHANICS OF STRUCTURES" VOL.I, Charotar Publishing House.
6. L.S Negi & R.S. Jangid, "Structural Analysis", Tata McGraw Hill
7. K U Muthu, "Basic structural Analysis" I K International Publishing House
8. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
9. S. P. Timoshenko and D. Young, "Theory of Structures" Mc-Graw Hill Book Publishing Company Ltd
10. Devdas Menon, "Structural Analysis" Vol I, Narosa Publication
11. T.S. Thandavamoorthy, "Structural Analysis", Oxford University Press.

Software required / Web links:

Staad Pro Software
https://nptel.ac.in/courses/105/105/105105166/
https://nptel.ac.in/courses/105101085/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
Course Articulation Matrix

CO Statement (BCE-DS - 505A)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-505A.1	3	2	2	2	1	1	-	1	1	2	2	3	2	3
BCE-DS-505A.2	3	1	1	2	-	2	3	1	1	-	2	1	2	3
BCE-DS-505A.3	2	2	2	2	-	-	-	-	-	-	2	2	2	3
BCE-DS-505A.4	1	3	3	3	2	-	-	1	1	-	2	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-506A: CONCRETE TECHNOLOGY

Credits 2		Max. Marks	: 200
L-T-P 2-0-0		Continuous Evaluation	: 100
Examination Duration 3 hrs		End Semester Exam	: 100

Prerequisite: None
Course Type: Program Core

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

BCE-DS-506A.1. Describe the role of cement, aggregates and water in concrete along with detailed study of cement.
BCE-DS-506A.2. Conduct different tests that can be performed on coarse and fine aggregates and grading curves.
BCE-DS-506A.3. Comprehend properties of fresh concrete and hardened concrete, affect of water cement ratio on strength of concrete.
BCE-DS-506A.4. Make use of admixtures both mineral and chemical in concrete
BCE-DS-506A.5. Develop special concretes.
BCE-DS-506A.6. Design concrete mix to suit different site requirements.

PART-A

Unit-1: Introduction

1.1 Definition of concrete, brief introduction to properties of concrete, advantages of concrete, uses of concrete in comparison to other building materials
1.2 Ingredients of Concrete
1.3 Cement: physical properties of cement; different types of cement:

Unit-2.: Fine Aggregate and Coarse Aggregate

2.1 Classification of aggregates according to
 2.1.1 Particle size, shape and surface texture,
2.2 Specific gravity of aggregate; Bulk density, water absorption, surface moisture, bulking of sand, deleterious materials soundness
2.3 Grading of aggregates: coarse aggregate, fine aggregate; All-in aggregate; fineness modulus; interpretation of grading charts

Unit-3: Properties of Concrete

3.1 Properties in plastic state, Workability, Segregation, Bleeding and Harshness
3.2 Properties in hardened state: Strength, Durability, Impermeability, Dimensional changes;
3.3 Principle of water-cement ration law/Duff Abram's Water-cement ratio law: Limitations of water-cement law
3.4 Definition of strength of concrete, relation between water cement ratio and strength of concrete
3.5 Workability:
 3.5.1 Definition, phenomenon of workability, concept of internal friction, segregation and harshness; factors affecting workability
 3.5.2 Measurement of workability: slump test, compacting factor and vee bee consistometer; recommended slumps for placement in various conditions as per IS: 456-2000

PART-B

Unit-4: Admixtures

4.1 Chemical admixtures (Plasticizers, Accelerators and Retarders, Water reducing admixtures, Air-entraining admixtures)
4.2 Mineral admixtures
4.3 Fly ash
4.4 Silica fumes
4.5 Rice husk ash
4.6 Meta Kaolin

Unit-5: Special Concretes

5.1 Concreting under special conditions
    5.1.1 Cold weather concreting
    5.1.2 Under water concreting
    5.1.3 Hot weather concreting
5.2 Fibre reinforced concrete
5.3 Ferro Cement
5.4 Light Weight Concrete
5.5 Polymer concrete
5.6 High Density Concrete
5.7 Self Compacting Concrete
5.8 High Performance Concrete

Unit-6: Mix Design

6.1 Objectives of mix design, introduction to various grades as per IS: 456-2000; proportioning for normal mix as prescribed by IS: 456-2000.
6.2 Adjustment on site for: Bulking of fine aggregate, water absorption of aggregate, workability
6.3 Difference between normal and controlled concrete
6.4 Principles of concrete mix design, basic considerations
6.5 Factors in the choice of mix design.
6.6 Outline of mix design procedure.

Text Books/ Reference Books:

1. M.S Shetty,Concrete Technology, S Chand Publications.
2. M.L Gambhir,Concrete Technology, Tata Mc Graw Hill Publications.
3. A.M Neville, Properties Of Concrete, Pearson Education, Fourth edition
4. IS 383:1970- Coarse and fine aggregates from natural source for concrete.
5. IS: 10262:2009- Concrete mix proportioning-Guidelines.
6. S.P.-23 Handbook on concrete mixes.

Software required / Web links:

http://nptel.ac.in/courses/105102012/
http://www.alphace.ac.in/downloads/notes/cv/10cv81.pdf

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-506A)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-506A.1	-	3	1	2	-	1	-	1	1	1	2	3	2	2
BCE-DS-506A.2	-	3	2	-	-	-	-	1	2	1	1	2	2	-
BCE-DS-506A.3	1	3	1	2	-	-	-	-	1	1	1	2	-	1
BCE-DS-506A.4	1	-	2	1	-	-	-	2	1	1	2	3	1	-
BCE-DS-506A.5	1	-	1	-	-	1	-	1	2	1	3	3	-	2
BCE-DS-506A.6	2	1	2	2	-	1	-	-	2	1	1	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-507: Environmental Engineering-I

Periods/week Credits	Max. Marks: 200
L: 2 T: 0 2	Internal/Continuous Evalution: 100
Duration of Examination: 3 Hrs	External/ End Semester Examination: 100

Pre-requisites: None
Course Type: Program Core

Course Outcomes: The students will be able to
BCE-DS-507.1 Relate to the concept of water demand
BCE-DS-507.2 Carry out water quality assessment studies
BCE-DS-507.3 Select the most appropriate technique for the treatment of water
BCE-DS-507.4 design various components of water treatment plant.

PART-A

Unit 1: Water Demand
1.1 Types of demand, factors affecting per capita demand, variations in demand,
1.2 Population forecasting and its application in planning of water supply schemes
1.3 Sources of water supply and quality issues: estimation of water quantity, factors governing the selection of source;
1.4 Water conservation measures, water safety plans
1.5 Types of intakes, factors governing the location of intake

Unit 2: Water Quality
2.1 Physical chemical and microbiological water quality parameters, their significance
2.2 Water quality analysis methods
2.3 Water borne diseases and their control
2.4 Drinking water quality criteria and standards

Unit 3: Water Treatment
3.1 Objectives of water treatment
3.2 Treatment processes and their sequence in conventional treatment plant.
3.3 Sedimentation - plain and aided with coagulation. Types, features and design aspects
3.4 Mixing basins and Flocculation units.
3.5 Filtration - mechanism involved, types of filters, slow and rapid sand filtration units (features and design aspects)
3.6 Disinfection principles and aeration.

PART-B

Unit-4: Other Treatment Processes:
4.1 Water softening, Chemical precipitation
4.2 Ion exchange, reverse osmosis;
4.3 Filtration: theory of filtration, types of filters and their classification, filter operations;
4.4 Disinfectioning: types of disinfectants, chlorination;

Unit-5: Water Conveyance System:
5.1 Conveyance of water
5.2 Rising and Gravity system, Dual systems
5.3 Pumping Systems and pumping stations
5.4 Valves and appurtenances, pipe materials and pipe fitting,

Unit-6: Water Distribution System:
6.1 Water distribution system, requirements of a good distribution system,
6.2 Methods of distribution,
6.3 Layout and design of water supply systems
6.4 Distribution Reservoir- functions and determination of storage capacity

Text Books/ 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. Engineering Organization, Ministry of Urban Development, Government of India
5. Peavy Howard S, Rowe Donald R, Tchobanglous Geroge, Environmental Engineering, McGraw Hill Education (India) Pvt Ltd 2013
6. Water Supply & Sanitary Engineering, G.S.Birdie, J.S.Birdie, 10^{th} Edition, Dhanpat Rai Publishing Company (2015)
7. Water Supply Engineering, S.K.Garg, Khanna Publishers, 2010, Khanna Publishers

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examinationCourse Articulation Matrix

CO Statement (BCE-DS-507)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2
BCE-DS-507.1	2		1			2	3	2					3	2
BCE-DS-507.2		1					2						2	3
BCE-DS-507.3					2					3	2		3	2
BCE-DS-507.4				2				3	2	3			3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-552-: GEOTECHNICAL ENGINEERING LAB

Credits	1	Max. Marks	: 100
L-T-P	0-0-2	Continuous Evaluation	: 50
Examination Duration	2 hrs	End Semester Exam	: 50

Co-requisite: Geotechnical Engineering (BCE-DS-502)
Course Type: Program Core

Course Outcome: At the end of this course, the student will be able to:

BCE-DS-552.1. Recall soil types, its classification and index properties
BCE-DS-552.2. Demonstrate with Field density test methods
BCE-DS-552.3. Experiment with Proctor's compaction test for prediction of type of optimum moisture content and dry density.
BCE-DS-552.4. Examine permeability of the soil.
BCE-DS-552.5. Analyse Engineering properties of soil for obtaining shear strength required for analysis and design the foundation.
BCE-DS-552.6. Make use of soil testing and correlate with the field problems.

List of Experiments:

1. Visual Soil Classification and water content determination.
2. Determination of specific gravity of soil solids.
3. Grain size analysis-sieve analysis.
4. Liquid limit and plastic limit determination.
5. Field density by:
   i) Sand replacement method
   ii) Core cutter method
6. Proctor's compaction test.
7. Coefficient of permeability of soils.
8. Unconfined compressive strength test.
9. Direct shear test on granular soil sample.
10. Unconsolidated undrained (UU) triaxial shear test of fine grained soil sample.
11. Vane Shear test
12. Relative Density

Software required / Web links

home.iitk.ac.in/~madhav/geolab.html

Reference Books:

1. M D Braja, Soil Mechanics. Laboratory Manual, Oxford University Press
2. Shamsher Prakash, Engineering Soil Testing, Nem Chand & Brothers
3. R.F. Craig, Soil Mechanics, Chapman & Hall
4. R.D. Holtz and W.D. Kovacs, An Introduction to Geotechnical Engineering, Prentice Hall, NJ 4.

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

Assessment Tools:

Lab Practice
Mid-Term Viva
Surprise questions during practicals/Class Performance
File record
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-552)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-552.1	3	3	2	1	2	-	-	-	-	-	-	2	3	3
BCE-DS-552.2	3	3	2	1	2	-	-	-	-	-	-	2	3	3
BCE-DS-552.3	3	3	2	1	2	-	-	-	-	-	-	2	3	3
BCE-DS-552.4	3	3	2	1	2	-	-	-	-	-	-	2	3	3
BCE-DS-552.5	1	1	1	1	1	2	2	3	2	2	1	2	3	3
BCE-DS-552.6	1	2	2	2	2	2	2	2	2	2	2	2	3	3

BCE-DS-553: STRUCTURAL ENGINEERING LAB

Credits	1	Max. Marks	: 100
L-T-P	0-0-2	Continuous Evaluation	: 50
Examination Duration	2 hrs	End Semester Exam	: 50

Co-requisite: Structural Engineering
Course Type: Program Core

Course Outcomes: On completion of the course, the students will be able -

BCE-DS-553.1 To visualize the deflections and behavior of structural components
BCE-DS-553.2 To apply the concepts of elastic properties of materials.
BCE-DS-553.3 To practically as well as theoretically analyze typical structures such as Three Hinged Arches, Two Hinged Arches and Determinate Trusses.
BCE-DS-553.4 To study and visualize Cable Suspension Bridges and Portal Frames.
BCE-DS-553.5 To understand the theory of Columns and their buckling behavior.

<u>Lists of experiments</u>

1. Verification of reciprocal theorem of deflection using a simply supported beam.
2. Verification of moment area theorem for slopes and deflections of the beam.
3. To determine elastic properties of a beam.
4. Experimental and analytical study of a Three Hinged Arch.
5. Experiment on two hinged arch.
6. Sway in portal frames.
7. Study of cable suspension bridge.
8. Experimental and analytical study of a 3 bar pin jointed truss
9. Uniaxial tension test for steel (plain & deformed bars) using UTM
10. Experimental and analytical study of struts with various end conditions.

Reference Books:

1. Hibbler, Structural Analysis, Pearson Education.
2. C. S. Reddy, Basic Structural Analysis, Tata McGraw Hill.
3. S.B. Junnarkar Dr. H. J. Shah,Mechanics of Structures, Vol.I, Charotar Publishing House.
4. L.S Negi & R.S. Jangid, Structural Analysis, Tata McGraw Hill
5. K. U. Muthu et al, Basic structural Analysis, I K International Publishing House
6. Wilbur and Norris, Elementary Structural Analysis, Tata McGraw Hill.
7. S. P. Timoshenko and D. Young, Theory of Structures, Mc-Graw Hill Book Publishing Company Ltd
8. Devdas Menon, Structural Analysis, Vol I & II, Narosa Publication

Software required / Web links

http://nptel.ac.in/courses/105101085/
http://nptel.ac.in/courses/105105109/

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	60%
File/Record Keeping	20%
Class Performance	10%
Class Attendance	10%

Assessment Tools:
Lab Practice
Mid-Term Viva
Surprise questions during practicals/Class Performance
File record
Term end examination

Course Articulation Matrix

CO Statement (BCE- DS-553)	P O 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8		PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE- DS-553.1	3	3	2	1	2	-	-	-		-	-	-	2	3	1
BCE- DS-553.2	3	3	2	1	2	-	-	-		-	-	-	2	3	1
BCE- DS-553.3	3	3	2	1	2	-	-	-		-	-	-	2	3	1
BCE- DS-553.4	1	1	1	1	1	2	2	3		2	2	1	2	1	1
BCE- DS-553.5	1	2	2	2	2	2	2	-		-	-	-	-	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956**)**

BCE-DS-652: Environmental Engineering Lab

Credits	1	Max. Marks	: 100
L-T-P	0-0-2	Continuous Evaluation	: 50
Examination Duration	2 hrs	End Semester Exam	: 50

Pre-requisites: None
Course Type: Program Core

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

BCE-DS-652.1 Make use of water quality characteristics
BCE-DS-652.2 Identify effect of the pollutants on the environment: atmosphere, water and soil.
BCE-DS-652.3 Plan strategies to control, reduce and monitor pollution
BCE-DS-652.4 Select the most appropriate technique for the treatment of water, wastewater solid waste and contaminated air.
BCE-DS-652.5 Apply water quality testing protocols.

Practical Work: List of Experiments

1. Physical Characterization of water: Turbidity, Electrical Conductivity, pH
2. Analysis of solids content of water: Dissolved, Settleable, suspended, total, volatile, inorganic etc.
3. Alkalinity and acidity, Hardness: total hardness, calcium and magnesium hardness
4. Analysis of ions: copper, chloride and sulfate
5. Optimum coagulant dose
6. Chemical Oxygen Demand (COD)
7. Dissolved Oxygen (D.O) and Biochemical Oxygen Demand (BOD)
8. Break point Chlorination
9. Bacteriological quality measurement: MPN,
10. Ambient Air quality monitoring (TSP, RSPM, SOx, NOx)
11. Ambient noise measurement

Text Books/ Reference Books:

1 Gilbert Masters, Introduction to Environmental Engineering and Science, Prentice Hall, New Jersey.
2 P. AarneVesilind, Susan M. Morgan, Introduction to Environmental Engineering.
3 Peavy, H.S, Rowe, D.R, Tchobanoglous, 1985, G. Environmental Engineering, Mc-Graw -Hill International Editions
4 MetCalf and Eddy, Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.

Distribution of Continuous evaluation table

Parameter	Weightage
Two Mid-Term Viva	**60%**
File/Record Keeping	**20%**
Class Performance	**10%**
Class Attendance	**10%**

Assessment Tools:

Viva-voce
Lab Report
Surprise questions during laboratory sessions
Term end final evaluation

Course Articulation Matrix

CO Statement (BCE-DS-652)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-652.1	2	2	3	3									3	2
BCE-DS-652.2					3		2	3		2			2	3
BCE-DS-652.3			2	2	3	2	3			2	1	2	3	2
BCE-DS-652.4			2	2	3	2	3			2			3	2
BCE-DS-652.5								3	2	2	2	1	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956**)**

DTI -500: Design, Thinking and Innovation -III

Periods/week	Credits	Max. Marks : 50
L:0 T:2 P:0	2	Continuous Assessment : 50

Pre-requisites: Design, Thinking and Innovation -II
Course Type: Research & Training
Course Coordinator: Mr. Yaman Hooda

Course outcomes

The students will be able to**:**

DTI – 500.1 Understand the Plagiarism / Feasibility tools
DTI – 500.2 Document the outcome as Research Paper / Patent / Product / Start-up /copyright

Activity 1:

1.1 Compilation / Documentation of the outcome (Research Paper / Patent / Product / Start-up /copyright).
1.2 Plagiarism / Feasibility check.
1.3 Identification of the suitable Journal / Patenting Agencies / Angel Investors.
1.4 Submission to the identified Journal / Patenting Agencies / Angel Investors.

Course Articulation Matrix:

CO Statement (DTI-500)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
DTI-500.1	-	3	-	-	-	-	-	3	-	-	-	1	-	-
DTI -500.2	-	3	2	3	2	2	2	3	3	3	2	2	3	3

'3' (Tick) or 'More' Substantial/High Correlation, '2' Moderate/Medium Correlation, '1' Slightly/Low Correlation, 'Blank' No Correlation

Evaluation Criteria: The following evaluation parameters shall be considered for internal assessment by both research coordinators and faculty coordinator or research mentors:-

S. No.	Parameters	Description	(Marks)
1.	**Attendance**	• Percentage of classes attended by the students	**5**
2.	**Continuous Performance**	• Judge individual student's participation in the Activities • Time bound completion of Activities	**15**
3.	**Accomplishment of the Outcome**	• Quality of the content and results • Acceptance of the outcome (Research Paper/ Patent/ Product/ Copyright) • Report submission / Presentation	**30**

References:

1. www.originlab.com
2. http://www.cambridgesoft.com/software
3. http://www.synergy.com/
4. www.mathworks.com/products/matlab.html

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BHM-MC-008: QUANTITATIVE APTITUDE& PERSONALITY DEVELOPMENT II

Periods/week Credits	Max. Marks	: 100
P:2 T:0 AP	Continuous Evaluation	: 50
Duration of Exam: 2hrs	End Sem Exams	: 50

Course Outcomes: At the end of this course, the student will be able to:
BHM-MC-008.1. Analyze various forms of data.
BHM-MC-008.2. Solve complex problems based on arithmetic reasoning.
BHM-MC-008.3.Apply short tricks on complex problems of number system.
BHM-MC-008.4.Enhance and expand word knowledge by fostering word consciousness.
BHM-MC-008.5. Construct simple and complex sentences accurately.
BHM-MC-008.6.Develop reading skills & build verbal reasoning skills.

PART-A

Unit 1: Number System II

1.1 Factors and Multiples
1.2 Unit Digits &Cyclicity
1.3 Remainders
1.4 Factorials
1.5 Logarithm

Unit 2: Arithmetic III

2.1 Interest
- 2.1.1 Simple Interest
- 2.1.2 Compound Interest
- 2.1.3 Relation between SI & CI

2.2 Time, Speed & Distance
- 2.2.1 Basics Formulas & Proportionality
- 2.2.2 Average & Relative Speed
- 2.2.3 Trains and Boats & Streams
- 2.2.4 Circular Motion and Clocks

2.3Data Interpretation
- 2.3.1 Table and Bar graph
- 2.3.2 Line and Pie Charts
- 2.3.1 Mixed Charts and Caselets

Unit 3: Verbal Reasoning III

- 3.1 Calendar
- 3.2 Cubes and Dices
- 3.3 Data Sufficiency

PART-B

Unit 4: Advanced Vocabulary

- 4.1 Synonym & Antonym
- 4.2 One Word Substitution
- 4.3 Ordering of Words
- 4.4 Idioms and Phrases

4.5 Vocabulary, COW, Punctuation

Unit 5: Sentence Construction & Syntax

5.1 Sentence Improvement
5.2 Spotting Errors
5.3 Ordering of Sentences
5.4 Change of Voice/ Direct & Indirect speech
5.5 Completing Statements/Sentences

Unit 6: Reading Comprehension & Reasoning

6.1 Strategic Reading, Eliminating Poor Reading Habits
6.2 Techniques to increase speed reading, comprehension and recall
6.3 Solving Sample RC Passages
6.4 Closet Test
6.5 Para Jumbles

Text Books/Reference Books:

1. R S Aggarwal, 2017, Quantitative Aptitude for Competitive Examinations, S Chand & Company Pvt Ltd, Edition
2. R S Aggarwal, 2018, A Modern Approach to Verbal& Non Verbal Reasoning: S Chand & Company Pvt Ltd, Edition
3. R S Aggarwal, An Advanced Approach to Data interpretation, S Chand & Company PvtLtd, latest Edition
4. P.A. Anand, Verbal Ability and Reasoning for Competitive Examinations, Wiley

Instructions for paper setting: Fifty MCQ will be set in total. Twenty-five MCQ will be set from Part A and twenty five MCQ will be set from Part B. All questions will be compulsory. Each question will be of 1 mark. There will be no negative marking. Calculator will not be allowed.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS1	PS2
BHM-MC-008.1	1	-	-	-	-	1	-	-	-	-	-	1	-	1
BHM-MC-008.2	1	-	-	-	-	1	-	-	-	-	-	1	-	1
BHM-MC-008.3	1	-	-	2	-	-	-	-	-	-	-	-	-	1
BHM-MC-008.4	1	-	1	-	-	-	-	-	1	3	1	2	1	2
BHM-MC-008.5	1	-	1	1	-	1	-	-	1	3	1	2	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-501-HYDRAULIC ENGINEERING

Credits 3	Max. Marks : 200
L-T-P 3-0-0	Continuous Evaluation : 100
Examination Duration 3 hrs	End Semester Exam : 100

Pre-requisites: Introduction to Fluid Mechanics (BCE-DS-401)
Course Type: Program Core
Course Outcomes

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

BCE-DS -501.1 Learn use of basic concepts of flow of fluids and resistance to flow
BCE-DS -501.2 Use definitions and terminologies to identify boundary layer
BCE-DS -501.3 Relate to type and categories of design open channel flow , pipe flow and economical section of channel .
BCE-DS -501.4 Analyze relationship between uniform and non uniform flow
BCE-DS -501.5 Apply the concept of hydraulic jump , surge and Dynamic of fluid flow .
BCE-DS -501.6 Derive the equation of boundary layer to model fluid problems.

PART-A

Unit 1: **Laminar Flow**

1.1 Laminar flow through: circular pipes, annulus and parallel plates, Stoke's law, Measurement of viscosity.
1.2 Turbulent Flow- Reynolds experiment, Transition from laminar to turbulent flow.
1.3 Definition of turbulence, scale and intensity, Causes of turbulence, instability,
1.4 Mechanism of turbulence and effect of turbulent flow in pipes.
1.5 Reynolds stresses, semi-empirical theories of turbulence,
1.6 Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes, Moody's diagram.

Unit 2: Boundary Layer Analysis

2.1 Assumption and concept of boundary layer theory, Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate
2.2 Laminar sub-layer, smooth and rough boundaries.
2.3 Local and average friction coefficients. Separation and Control.
2.4 Dimensional Analysis and Hydraulic Similitude: Dimensional homogeneity
2.5 Rayleigh method, Buckingham's Pi method and other methods.
2.6 Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problem.

Unit 3: **Introduction to Open Channel Flow**

3.1 Comparison between open channel flow and pipe flow, geometrical parameters of a channel, 3.2 classifications of open channels, classification of open channel flow, Velocity Distribution of channel section.
3.3 Uniform Flow-Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow,
3.4 Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient

3.5 Most economical section of channel-derivation and concept, Computation of Uniform flow, Normal depth.

PART-B

Unit 4: Non-Uniform Flow

4.1 Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth.
4.2 Channel Transitions. Measurement of Discharge and Velocity – Venturi Flume, Standing Wave Flume, Parshall Flume, Broad Crested Weir.
4.3 Measurement of Velocity- Current meter, Floats, Hot-wire anemometer. Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow,
4.4 Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile.
4.5 Computation of water surface profile by graphical, numerical and analytical approaches.
4.6 Direct Step method, Graphical Integration method and Direct integration method.

Unit 5: Hydraulic Jump & Dynamics of Fluid Flow

5.1 Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump.
5.2 Types, applications and location of hydraulic jump.
5.3 Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges.
5.4 Momentum principle, applications: Force on plates, pipe bends, moments of momentum Equation

Unit 6: Flow through Pipes

6.1 Loss of head through pipes, Darcy-Wiesbatchequation,minor losses, total energy equation, hydraulic gradient line
6.2 Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles.
6.3 Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three reservoir problem.
6.4 Computational Fluid Dynamics: Basic equations of fluid dynamics, Grid generation, Introduction to in viscid incompressible flow,
6.5 Boundary layer flow as applicable to C.F.D. Hydro informatics: Concept of hydro informatics –scope of internet and web based modeling in water resources engineering. .

Text/Reference Books:

1. P.M. Modi and S.M. Seth Hydraulics and Fluid Mechanics, Standard Book House
2. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill.
3. K. Subramanya, Open channel Flow, Tata McGraw Hill.
4. VenTe Chow, Open Channel Hydraulics, Tata McGraw Hill.
5. C.DBurnside, 1971, Electromagnetic Distance Measurement, Beekman Publishers

Software required / Web links

http://nptel.ac.in/courses/112105171/
http://nptel.ac.in/courses/112105183/
http://nptel.ac.in/courses/105101082/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-501)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-501.1	3	3	3	3	3	-	-	2	-	2	2	3	3	3
BCE-DS-501.2	3	3	3	3	3	-	-	2	-	2	2	3	3	3
BCE-DS-501.3	3	3	3	3	3	-	-	2	-	2	2	3	3	2
BCE-DS-501.4	3	3	3	3	3	-	-	2	-	2	3	3	3	2
BCE-DS-501.5	3	3	3	3	3	-				1	3	3	3	3
BCE-DS-501.6	3	3	3	3	3	-	-	2	-	3	3	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-521: PAVEMENT MATERIALS

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Transportation Engineering (BCE-DS-406)
Course Type: Domain Specific Elective
Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-521.1. Classify different types, characteristics of soil and their strength evaluation methods
BCE-DS-521.2. Categorize various properties of aggregate for pavement
BCE-DS-521.3. Summarize the concept of bitumen and its effects on construction of pavement
BCE-DS-521.4. Describe the various mechanical properties of bituminous mixes
BCE-DS-521.5. Design various bituminous mixes which fulfill the required properties of pavement material
BCE-DS-521.6. Apply IRC guidelines and material know-how to design of cement concrete pavement

PART-A

Unit 1: Soil
1.1 Classification; Characteristics of soil
1.2 Compactionof soil
1.3 Evaluation of soil strength
1.4 Stabilized pavement materials
Unit 2: Aggregates
2.1 Requirements
2.2 Properties and tests on road aggregates for flexible pavement
2.3 Properties and tests on road aggregates for rigid pavements
Unit 3: Bitumen
3.1 Origin &preparation
3.2 Properties and tests
3.3 Constitution of bituminous road binders; requirements
3.4 Criterion for selection of different binders
3.5 Bituminous Emulsions and Cutbacks: Preparation, characteristics, uses and tests

PART-B

Unit 4: Bituminous Mixes
4.1 Mechanical properties
4.2 Resilient modulus, dynamic modulus
4.3 Fatigue characteristics of bituminous mixes
Unit 5: Bituminous Mix Design
5.1 Bituminous mix design methods and specifications
5.2 Weathering and durability of bituminous materials and mixes
5.3 Performance based bitumen specifications
5.4 Super pave mix design method: design example problems

Unit 6: Cement Concrete for Pavement Construction
6.1 Requirements and design of mix for CC pavement
6.2 IRC and IS specifications and tests
6.3 Joint filler and sealer materials

Text Books/ Reference Books

1. A. T. Papagiannakis, E. A. Masad, 2007, Pavement Design and Materials, John Wiley & Sons,inc., 1st Edition
2. Shin-Che Huang, Di Benedetto, Hervé, 2015, Advances in Asphalt Materials: Road and Pavement Construction' , Wood head Publishing Series in Civil and Structural Engineering, 1st Edition
3. Geo; W. Tillson, 2017' Street Pavements and Paving Materials: A Manual of City Pavements, the Methods and Materials of Their Construction, Forgotten Books
4. S.KKhanna., C.E.G Justo, and, A. Veeraragavan, 2017,Highway Engineering', Revised, Nem Chand & Bros, 10th Edition
5. A. Nikolaides, Bituminous Mixtures and Pavements VI, 1st Edition, e-book

Software required/Weblinks:
https://nptel.ac.in/courses/105101087/23

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-521)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2
BCE-DS-521.1. B	1	1	2	1	-	2	2	1	-	-	-	2	3	2
BCE-DS-521.2. B	1	1	2	1	-	2	2	1	-	-	-	2	3	2
BCE-DS-521.3. B	1	2	3	2	1	1	2	-	2	2	2	2	3	2
BCE-DS-521.4. B	1	1	2	1	-	2	2	1	-	-	-	2	3	2
BCE-DS-521.5.	1	1	2	1	-	2	2	1	-	-	-	2	3	2
BCE-DS-521.6. B	1	2	3	2	1	1	2	-	2	2	2	2	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

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BCE-DS-522: DESIGN OF HYDRAULIC STRUCTURES

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Prerequisite: Fluid Mechanics, Applied Physics-I, Applied Mechanics

Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-522.1 Interpret irrigation and irrigation system
BCE-DS-522.2 Design lined and unlined channels.
BCE-DS-522.3 Identify the location and build of canal falls
BCE-DS-522.4 Demonstrate the various hydraulic structure components.
BCE-DS-522.5 Select the site for the construction of dam.
BCE-DS-522.6 Design Spillways.

PART-A

Unit I: Basics of Irrigation

1.1 Irrigation: Necessity and Methods of Irrigation.
1.2 Water requirement of crops: Duty, Delta, Base Period.
1.3 Consumptive use of water, Principal crops and crop season, crop rotation.
1.4 Canal irrigation system, Command area and Intensity of Irrigation.
1.5 Irrigation efficiencies.

Unit II: Design of lined and unlined channels

2.1 Design of lined canals using Chezy's and Manning's formulae, Most economical sections
2.2 Necessity/Advantages of canal Lining.
2.3 Design of unlined canals based on Lacey's theory.
2.4 Types of canal outlets.

Unit III: Canal Falls

3.1 Canal falls - Necessity and location, types of falls.
3.2 Roughening devices.
3.3 Diversion canal headworks: Various components and their functions, layout plan, selection of site for diversion headworks.
3.4 Silt control devices: Silt excluders and Silt ejectors.

PART-B

Unit IV: Regulation Works

4.1 Cross - regulator and distributory head regulators.
4.2 Canal escapes, types of escapes.
4.3 Bligh's creep theory and its application.
4.4 Mode of failure of hydraulic structures on permeable foundation.
4.5 Cross Drainage Structures: Classification and their selection.

Unit V: Storage Head works

5.1 Necessity and types of dams.
5.2 Selection of site for the construction of dam.
5.3 Merits and demerits of different types of dams and their selection.
5.4 Earth dam, seepage through earth dams, determination of seepage line.
5.5 Control of seepage, design of filters.

Unit VI: Spillways

6.1 Essential requirements of spillway and spillway's capacity.
6.2 Types of spillways and their suitability.
6.3 Location of spillways.
6.4 Design of Ogee spillways.

Text/Reference Books:

1. S. K. Garg, 2014 Irrigation Engineering and Hydraulics Structures, Khanna Publishers,
2. Dr. B. C. Punmia, 2009, Irrigation and Water Power Engineering, Laxmi Publications,
3. P. N. Modi, 2014, Irrigation Water Resources & Water Power Engineering, Standard Book House
4. Bharat Singh,2005, Fundamentals of Irrigation Engineering, Nem Chand & Bros,
5. N. N. Basak, 2014 Irrigation Engineering, Tata McGraw Hill
6. G. L. Asawa, 2005 Irrigation and Water Resources Engineering, New Age International Publishers

Software required/Web links

http://nptel.ac.in/courses/126104001/
http://nptel.ac.in/courses/105105110/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-522**)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
BCE-DS-522.1	3	2	2	-	2	1	-	2	2	1	1	1	2	1
BCE-DS-522.2	3	3	3	1	3	2	-	3	2	3	3	3	3	2
BCE-DS-522.3	2	1	1	-	1	2	-	2	2	2	1	1	2	1
BCE-DS-522.4	3	2	2	2	1	1	-	2	2	2	2	3	3	3
BCE-DS-522.5	3	2	3	2	2	2	-	3	2	2	2	3	2	2
BCE-DS-522.6	3	2	2	2	3	2	-	2	2	2	2	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-523: ENGINEERING MATERIALS FOR SUSTAINABILITY

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: None
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-523.1 Define Material Flow Analysis
BCE-DS-523.2 Estimate sustainability metrics for Material selection
BCE-DS-523.3 Quantify LEED and ASCE guideline
BCE-DS-523.4 Relate Life Cycle Assessment to material selection
BCE-DS-523.5 Apply sustainability concepts to design of structural components

PART-A

UNIT 1: Introduction
1.1 Material properties
1.2 Material markets
1.3 Material Flow Analysis (MFA)
1.4 Embodied and process energies of materials
1.5 Impact on the Biosphere
1.6 Optimization of material use

UNIT 2: Sustainability Concepts
2.1 Definitions
2.2 Impacts of Civil Engineering on sustainability
2.3 Parameters used In the Calculation of Sustainability Metrics
2.4 Estimate sustainability metrics for select materials

Unit 3: Sustainable Civil Engineering Design Practice
3.1 ASCE Policy on the Role of the Engineer in Sustainability
3.2 Discussion on LEED and other guidelines
3.3 Estimate sustainability metrics for application-material combinations

Part-B

Unit 4: Life-Cycle Assessment (LCA)
4.1 Use of sustainability metrics in LCA
4.2 Selection of materials using LCA

Unit 5: Material Specifications
5.1 Components of a material specification
5.2 Sustainability-based material specifications

Unit 6: Design Project

6.1 Application of sustainability concepts in a real project
6.2 Conduct sustainability-based material selection for a simple project
6.3 Design a structural component by integrating sustainability concepts

Text Books/ Reference Books:

1. Michael F. Ashby, Materials and Sustainable Development

Software required / Web links:

http://aspire.surrey.ac.uk/modules/eng1078

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-523)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-523.1	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-523.2	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-523.3	3	3	3	2	2	-	-	-	-	-	-	2	3	2
BCE-DS-523.4	3	3	3	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-523.5	3	3	3	3	3	-	-	-	-	-	-	2	3	2
BCE-DS-523.6	1	1	1	1	2	3	3	3	3	3	3	2	2	3

BCE-DS-524: Green and Renewable Energy
Proposed Syllabus(will be put up for approval in next BOS)

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Prerequisite: None
Course Type: Domain Specific Elective
Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-524.1 List and generally explain the main sources of energy and their primary applications nationally and internationally
BCE-DS-524.2 Have basic understanding of the energy sources and scientific concepts/principles behind them.
BCE-DS-524.3 Understand effect of using these sources on the environment and climate
BCE-DS-524.4 Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment
BCE-DS-524.5 List and describe the primary renewable energy resources and technologies.
BCE-DS-524.6 To quantify energy demands and make comparisons among energy uses, resources, and technologies

Unit 1: Introduction to Energy Science:
1.1 Scientific principles and historical interpretation to place energy use in the context of pressing societal,
1.2 environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy,
1.3 sustainability & the environment
Module 2: Energy Sources:
2.1 Overview of energy systems, sources, transformations, efficiency, and storage.
2.2 Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future,
2.3 Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen;
2.4 Sustainability and environmental trade-offs of different energy systems;
2.5 possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries).
Module 3:Energy & Environment:
3.1 Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development;
3.2 Carbon footprint, energy consumption and sustainability;
3.3 introduction to the economics of energy;
3.4 How the economic system determines production and consumption;
3.5 linkages between economic and environmental outcomes;
3.6 How future energy use can be influenced by economic, environmental, trade, and research policy.
Module 4: Civil Engineering Projects connected with the Energy Sources:
4.1 Coal mining technologies, Oil exploration offshore platforms,
4.2 Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.;

4.3 Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings;
4.4 Spent Nuclear fuel storage and disposal systems.

Module 5: Engineering for Energy conservation:
5.1 Concept of Green Building and Green Architecture;
5.2 Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated);
5.3 LEED ratings;
5.4 Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates;
5.5 Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption

Text/Reference Books:

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

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-524**)**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-524.1	3	2	2	-	2	1	-	3	2	1	2	1	2	2
BCE-DS-524.2	3	2	2	1	3	2	-	3	2	3	3	1	3	1
BCE-DS-524.3	1	1	3	-	1	3	-	1	2	2	2	1	2	2
BCE-DS-524.4	2	2	2	2	1	1	-	3	2	2	3	2	3	2
BCE-DS-524.5	2	2	3	2	2	2	-	2	2	2	3	2	2	3
BCE-DS-524.6	2	2	2	2	3	2	-	3	2	2	3	2	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-525: Sustainable Architecture

PerioXX/week Credits	Max. Marks: 200
L: 2 P: 2 3	Internal/Continuous Evaluation: 100
Duration of Examination: 3 Hrs	External/ End Semester Examination: 100

Pre-requisites: None
Course Type: Program Elective
Course Outcomes: The students will be able to

BCE-DS-525.1 develop a relation between sustainable principles at both regional and local scale
BCE-DS-525.2 practice the strategies and processes that shape sustainable architecture
BCE-DS-525.3 acquire a comprehensive knowledge about the Principles urban design
BCE-DS-525.4 explore the emerging concepts and role of GIS Applications concerning current and future development.

PART A

Unit 1: Introduction to Sustainable Architecture

1.1 Concepts and Principles of Sustainable Architecture
1.2 Variables of Sustainability and their relation with real world
1.3 Vernacular Hill Architecture
1.4 Role of a Sustainable Architect

Unit 2: Building Science and Sustainability

2.1 Thermal Conductivity and Resistance
2.2 Building Energy: Calculations, Gains and Loss
2.3 Importance of Energy to Human Development
2.4 conventional and renewable energy sources

Unit 3: Fundamentals of Ecology

3.1 Basic Introduction
3.2 Impacts of Urbanization
3.3 Environmental Policies
3.4 Ecological Design Approach

PART B

Unit 4: Landscape Architecture

4.1 Introduction
4.2 Elements of Landscape
4.3 Site Analysis and Site Planning
4.4 Case Studies
4.5 Making out Architecture Plan on AutoCAD 2D

Unit 5: Urban Designing

5.1 Concept of Urban Designing
5.2 Concept of Urban Transformation
5.3 City – Human Network
5.4 Concept of Smart Cities

Unit 6: GIS Applications in Architecture

6.1 Concept of Remote Sensing and Mapping
6.2 Raster and Vector Data Form
6.3 Aerial Photogrammetry
6.4 Role of GIS in Mapping and Resource Monitoring
6.5 Applications of GIS in Design, Analysis and Planning

Text Books/ Reference Books:

1. Landscape Architecture by Simonds, John Ormsbee, McGraw-Hill New York.
2. Fundamentals of Ecology by E. P. Odum, W.B. Saunders, Philadelphia, UAR.
3. Urban Design: Green Dimensions by J. C. Moughtin, Peter Shirley,Rouledge.
4. Climate responsive architecture: a design handbook for energy efficient buildings by Krishan, A., Tata McGraw-Hill Education

Software required/Weblinks:

https://nptel.ac.in/courses/124/107/124107011/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-525)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	PS O 2
BCE-DS-525.1	2		1			2	3	2					3	2
BCE-DS-525.2		1					2						2	3
BCE-DS-525.3					2					3	2		3	2
BCE-DS-525.4				2				3	2	3			3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-526: Planning and Design of Sustainable Transport Systems
Proposed Syllabus(will be put up for approval in next BOS)

Credits	**3**	**Max. Marks**	**200**
Lectures/Week	**2 hrs**	**Internal/Continuous Evaluation**	**100**
Examination Duration	**3 hrs**	**External/ End Semester Exams**	**100**

NIL

Course Type: Domain Specific

Course outcomes: At the end of the course, the student will be able to

1. Understand the concept of sustainability, sustainable transportation, and related definitions
2. Comprehend the major sustainability issues in transportation system
3. Assess the impact of transportation system on environment
4. Make use of various design facilities to achieve sustainable mobility

PART-A

Unit-1: Introduction
1.1 Introduction to Transportation System
1.2 Concept of Sustainability
1.3 Current Scenario of Transportation in India
1.4 Climate Change
1.5 Impact of transportation Systems

Unit-2: Land Use Planning and Zoning
2.1 Introduction to Land Use
2.2 Land Use Planning and Zoning
2.3 Transit Oriented Development
2.4 TOD Implementation
2.5 TOD Case study

Unit-3: Sustainable Transportation Planning
3.1 Introduction to Sustainable Transportation Planning
3.2 Traditional Transportation Planning Process
3.3 Contemporary Transportation Planning Process
3.4 Management Strategies

PART-B

Unit-4: Life Cycle Assessment
4.1 Introduction
4.2 Material Flow Analysis
4.3 Concept of Circular Economy
4.4 Circular Economy in Transport sector

Unit-5: Transportation Environment
5.1 Modelling of Transport Emissions
5.2 Traffic Noise Emission Models
5.3 Initiatives and Policies for Environmental Sustainability
5.4 Decarbonizing the Transport sector
5.5 Alternate Fuels
5.6 Electric Vehicles and Sustainability

Unit-6: Environment Impact Analysis
6.1 Introduction to Environment Impact Analysis
6.2 EIA Processes
6.3 Methodologies of EIA
6.4 EIA Process in India
6.5 Global Practices in EIA Process
6.6 EIA Case-Study

Text Books/ Reference Books:

1. Black, W.R. (2010). Sustainable Transportation: Problems and Solutions. The Guilford Press, New York, NY.
2. Shiller, P.L., E. Bruun, and J.R. Kenworthy. (2010). An Introduction to Sustainable Transportation. Earthscan, London, Washington DC.
3. R. J. Salter and N. B. Hounsel, Highway Traffic Analysis and Design, Macmillan Press Ltd, 1996.

Software required/Weblinks:

https://archive.nptel.ac.in/courses/105/107/105107210/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
Course Articulation Matrix

Course Articulation Matrix

CO Statement (BCE-DS-526)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-526.1	2	2	1	3	1	2	-	-	3	-	1	2	3	1
BCE-DS-526.2	3	2	3	2	2	-	2	2	-	-	2	-	2	3
BCE-DS-526.3	3	1	2	2	1	-	2	3	2	3	2	-	2	3
BCE-DS-526.4	2	3	2	-	3	-	2	-	-	3	-	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

HM-506 : French-1

Periods/week Credits	Max. Marks	: 100
L: 2 T: 0 2	Continuous Evaluation	: 50
Duration of Examination: 1.5 Hrs	End Sem Examination	: 50

Pre-Requisite: Basic knowledge of grammatical structure, syntax, and vocabulary of English and/or Hindi.

Course Type: Humanities and Social Sciences

Course Outcomes: Students will be able to-

HM-506.1. Exchange greetings and do introductions using formal and informal expressions. They can understand and use interrogative and answer simple questions.

HM-506.2. Learn Basic vocabulary that can be used to discuss everyday life and daily routines, using simple sentences and familiar vocabulary. Express their likes and dislikes. Also will have understanding of simple conversations about familiar topics (e.g., greeting, weather and daily activities,) with repetition when needed.

HM-506.3. Identify key details in a short, highly-contextualized audio text dealing with a familiar topic, relying on repetition and extra linguistic support when needed. Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary.

HM-506.4. Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary. Provide basic information about familiar situations and topics of interest.

HM-506.5. Express or/and justify opinions using equivalents of different verbs. Differentiate certain patterns of behavior in the cultures of the French-speaking world and the student's native culture.

HM-506.6. Describe various places, location, themselves using simple sentences and vocabulary.

PART-A

Unit 1- Saluer et épeler l'alphabet

1.1 Les Salutations & forms of politeness

1.2 Alphabets

Unit 2- Usage de Vous et de Tu

2.1 Taking leave expressions

2.2 Les pronoms sujets

2.3 Basic Questions

Unit 3- Présentez-vous

3.1 Les verbes ER

3.2 Self introduction

3.3 Décrivez votre ami(e)

PART-B

Unit 4- Identifier un nombre, compter

4.1 Les noms

4.2 Verbes Avoir, Etre, Aller & Faire

4.3 Les nombres

Unit 5- Demander/ donner l'explications

5.1 Les articles define et indefini

5.2 Les mois de l'annee

5.3 Les jours de la semaine

Unit 6- Parler des saisons et demander l'heure

6.1 Time

6.2 Weather

6.3 Unseen Passage

Text Books/Reference Books/ Suggested Readings:

1. Alter Ego Level One Textbook: Annie Berthet, Catherine Hugot, Veronique M Kizirian, 2006, Hachette Publications.
2. Apprenons Le Francais II & III: Mahitha Ranjit, 2014, Saraswati Publications.

Weblinks:

www.bonjourfrance.com

www.allabout.com

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

COURSE ARTICULATION MATRIX :

CO Statement (HM–506)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
HM-506.1	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-506.2	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-506.3	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-506.4	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-506.5	-	-	-	-	-	-	-	-	-	1	-	1	-	1
HM-506.6	-	-	-	-	-	-	-	-	-	1	-	1	-	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

NAAC 'A' Grade University

HM-507 : German-1

Periods/week Credits	Max. Marks	: 100
L: 2 T: 0 2	Continuous Evaluation	: 50
Duration of Examination: 1.5 Hrs	End Sem Examination	: 50

Pre-Requisite: Basic knowledge of grammatical structure, syntax, and vocabulary of English and/or Hindi.

Course Type: Humanities and Social Sciences

Course Outcomes: Students will be able to-

HM-507.1. Exchange greetings and introductions using formal and informal expressions. They will be able to ask and answer simple questions.

HM-507.2. Discuss everyday life and daily routines, using simple sentences and familiar vocabulary.

HM-507.3. Identify key details in short, highly-contextualized audio text dealing with a familiar topic, relying on repetition and extra linguistic support when needed.

HM-507.4. Discuss likes and dislikes, understand simple conversations about familiar topics (e.g., greetings, weather and daily activities,) with repetition when needed

HM-507.5. Differentiate certain patterns of behavior in the cultures of the German- speaking world and the student’s native culture.

HM-507.6. Describe various places, location, themselves using simple sentences and vocabulary.

PART-A

Unit-1: Begrüßungen

1.1 Salutations/Greetings

1.2 Introduction

Unit-2: sich vorstellen und Zahlen

2.1 Introduction

2.2 Alphabets

2.3 Numbers 1-20

Unit-3: Berufe/ Pronomen

3.1 Personal pronouns

3.2 Hobbies and professions

PART-B

Unit-4: Café

4.1 Café related vocabulary and dialogues

4.2 Revision personal pronouns

Unit-5: Café dialog

5.1 Café related vocabulary and dialogues

5.2 Common verbs and their conjugations

Unit-6: Zeit und Monate

6.1 Time
6.2 Days
6.3 Months

Text Books/Reference Books:

1. Studio D A1: Hermann Funk, 2011, Cornelson Publication.
2. Tangaram Aktuell A1: Kursbuch & Arbeitsbuch, 2011, Hueber.
3. Netzwerk: Stefanie Dengler, Paul Rusch, 2011, Klett.

Weblinks:

http://www.nthuleen.com/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX :

CO Statement (HM–507)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
HM-507.1	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-507.2	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-507.3	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-507.4	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-507.5	-	-	-	-	-	-	-	-	-	1	-	1	-	1
HM-507.6	-	-	-	-	-	-	-	-	-	1	-	1	-	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

HM-508 : Spanish-1

Periods/week Credits	Max. Marks	: 100
L: 2 T: 0 2	Continuous Evaluation	: 50
Duration of Examination: 1.5 Hrs	End Sem Examination	: 50

Pre-Requisite: Basic knowledge of grammatical structure, syntax, and vocabulary of English and/or Hindi.
Course Type: Humanities and Social Sciences

Course Outcomes: Students will be able to-

- HM-508.1. Exchange greetings and introductions using formal and informal expressions and students will be able to ask and answer simple questions.
- HM-508.2. Discuss everyday life and daily routines, using simple sentences and familiar vocabulary and students will be able to discuss likes and dislikes understand simple conversations about familiar topics.
- HM-508.3. Identify key details in a short, highly-contextualized audio text dealing with a familiar topic, relying on repetition and extra linguistic support when needed and students will be able to offer basic descriptions of self, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary.
- HM-508.4. Provide basic information about familiar situations and topics of interest and students will be able to express or/and justify opinions using equivalents of different verbs.
- HM-508.5. Differentiate certain patterns of behavior in the cultures of the Spanish-speaking world and student's native culture.
- HM-508.6. Describe various places, location, themselves using simple sentences and vocabulary.

PART-A

Unit 1: Introduction to Spanish and SER

1.1 Presentation on Spanish language
1.2 Greetings and goodbyes
1.3 Spanish letters
1.4 Introduction of Verbo SER

Unit 2: Verb Ser, Nationality, Profession and Counting

2.1 Uses of Verbo SER
2.2 Adjectives related to Verbo SER.
2.3 Introduction of Nationality
2.4 Professions and vocabulary related to professions.
2.5 Counting till number 20.

PART-B

Unit 3: Articles, Interrogative and Estar

3.1 Introduction of Articles and Indefinite articles
3.2 Interrogatives
3.3 Introduction of Verbo Estar

Unit 4: Estar, Preposition, Tener and Self Introduction

4.1 Uses of Verbo ESTAR and adjectives related to it

4.2 Prepositions related to the positioning of an object
4.3 Tener & its uses
4.4 Self – introduction

Unit 5 : Day, Month and Regular AR verb
5.1 Days
5.2 Months
5.3 Introduction to regular –AR verbs

Text Books/Reference Books:

1. Spanish Grammar: Eric V Greenfield, 1971, Barnes and Noble.
2. Nuevo Espanol sin fronteras 1 + Workbook + CD: Jesus Sanchez Lobato and Isabel Santos Gargallo, 2006, Goyal, Ele & Sgel.

Weblinks:
http://studyspanish.com/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
COURSE ARTICULATION MATRIX :

CO Statement (HM-508)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
HM-508.1	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-508.2	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-508.3	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-508.4	-	-	-	-	-	-	-	-	-	1	-	1	-	-
HM-508.5	-	-	-	-	-	-	-	-	-	1	-	1	-	1
HM-508.6	-	-	-	-	-	-	-	-	-	1	-	1	-	1

SEMESTER-VI

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

PROJ-CE-600A: PROJECT PHASE-I

Credits 1.0
L-T-P 0-0-2
Examination Duration 2 hrs
Prerequisite: None
Course Type: Project

Max. Marks : 100
Continuous Evaluation : 100
End Semester Exam : 00

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

PROJ-CE-600A.1 Identify engineering problems pertaining to their area of interest
PROJ-CE-600A.2 Conduct an extensive literature review on the identified problem area
PROJ-CE-600A.3 Design experiments in laboratory or field as maybe applicable
PROJ-CE-600A.4 Apply knowledge of mathematics, science, and engineering to real life Civil Engineering problems.
PROJ-CE-600A.5 Develop an understanding of professional and ethical responsibility and to communicate effectively.
PROJ-CE-600A.6 Function on multidisciplinary areas and in teams.

The objective of the project is to enable the students to work in groups of not more than four members in each group on a project involving analytical, experimental, design or combination of these in the area of Civil Engineering. Each project shall have a guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem.

Assessment Tools:
Title review
Mid-Term presentation
Guide's continuous comprehensive assessment
Term end presentation

Distribution of Continuous Evaluation:

Presentation/Viva	40%
Report	20%
Class Work/ Performance	20%
Attendance	20%

Course Articulation Matrix

CO Statement PROJ-CE-600A	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O 2
PROJ-CE-600A.1	3	1	-	-	2	-	-	-	-	-	-	-	3	3
PROJ-CE-600A.2	3	2	1	2	-	-	-	-	-	-	-	-	2	3
PROJ-CE-600A.3	3	2	1	1	1	1	-	-	-	-	2	-	3	3

PROJ-CE-600A.4	2	3	3	3	3	1	-	-	-	-	-	-	3	3
PROJ-CE-600A.5	3	3	1	3	1	-	-	-	-	-	-	-	3	3
PROJ-CE-600A.6	2	3	3	2	2	3	2	-	1	2	-	1	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-601A ESTIMATION, COSTING AND VALUATION

Credits	2	Max. Marks	200
L-T-P	1-0-2	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Examination	100

Pre-requisites: None
Course Type: Program Core

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS -601.1A Write general and detailed specifications of different Items of work in Civil Engineering works
BCE-DS -601.2A Analyze and calculate Rate analysis for different Items of work

BCE-DS -601.3A Apply the concept of various tenders including preparation, evaluation of tenders and Valuation of buildings
BCE-DS -601.4A Prepare estimates using software for various projects.

PART-A

Unit-I: Estimate
1.1 Principle of estimation, units, item work
1.2 Different kinds of estimates, different methods of estimation
1.3 Estimation of materials in single room building ,two room building with different sections of walls, foundation floors ,Plastering ,white washing, Distempering and painting ,doors and windows
1.4 Lump sum items
1.5 Estimates of canals, roads etc.

Unit-II: Specification of Works
2.1 Necessity of specification types of specification, general specification
2.2 Specification of bricks. Cement, sand, water, lime, reinforcement
2.3 Detailed specification for earthwork, cement, concrete, brickwork, flooring, D.P.C, R.C.C
2.4 Cement plastering, white and colour washing, distempering, and painting

Unit-III: Rate analysis
3.1 Purpose, importance and requirements of rate analysis, units of measurement
3.2 Preparation & procedure of rate analysis for items
3.3 Earth work .concrete works, R.C.C works
3.4 Plastering, painting, finishing (white washing ,distempering)

PART-B

Unit-IV: Public Works Account and billing
4.1 Tender – type, preparation,Process of issue and receipt, opening
4.2 Preparation of comparative statement and acceptance
4.3 Measurement book, administrative sanction, technical sanction
4.4 Preparation & Maintenance of muster roll,
4.5 Preparation of pay bill, measurement of work for payment of contractors

Unit-V: Valuation & Arbitration

5.1 Purpose & principles of valuation
5.2 Depreciation. sinking fund, salvage & scrap value
5.3 Valuation of a building-cost method rental returns method.
5.4 Indian contract Act
5.5 Arbitration Act and process of appealing.

Unit-VI: Estimation problems

6.1 Preliminary estimate using Plinth area method.
6.2 Detailed estimate of Load bearing structure using BIM/REVIT/ any estimation software
6.3. Calculation of steel with Bar bending Schedule using BIM/REVIT/ any estimation software
6.4. Detailed estimate of earthwork of road for Approximate 1km length using BIM/REVIT/ any estimation software

Text/Reference Books:

1. Patil, B.S., Civil Engineering Contracts, Vol. – I, Orient Longman Publication, 1998.
2. Rangwala, S.C., Elements of Estimating and Costing, Professional practice, Charotar Publishing House, Anand.
3. Aggarwal, A., Upadhyay, A.K., Civil Estimating, Costing & Valuation, S.K Kataria & Sons, New Delhi.
4. Chandola, S.P. and Vazirani, Estimating and Costing, Khanna Publication.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-601A)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BCE-DS-601A.1	3	3	2	1	3	-	-	1	1	1	-	2	3	3
BCE-DS-601A.2	3	3	2	1	3	-	-	1	1	1	-	2	3	3
BCE-DS-601A.3	3	3	2	1	3	-	-	1	1	1	-	2	3	3
BCE-DS-601A.4	3	3	2	1	3	-	-	1	1	1	-	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-603: HYDROLOGY & WATER RESOURCES ENGINEERING

Credits 3
L-T-P 2-1-0
Examination Duration 3 hrs
Prerequisite: none
Course Type: Program core

Max. Marks : 200
Continuous Evaluation : 100
End Semester Exam : 100

Course Outcomes At the end of this course, the student will be able to:
BCE-DS-603.1. Relate hydrological cycle and various phenomena affecting precipitation.
BCE-DS-603.2. Apply methods of measurement of evapo-transpiration.
BCE-DS-603.3. Solve the problems related to infiltration indices.
BCE-DS-603.4. Analyze the factors affecting runoff, measurement of velocity and stage in a river.
BCE-DS-603.5. Derive hydrographs for the various discharges.
BCE-DS-603.6. Estimate the various forms of ground-water availability.

PART-A

Unit-1: Introduction:

1.1 Hydrologic cycle, scope and application of hydrology to engineering problems
1.2 Drainage basin and its characteristics
1.3 Stream geometry, hypsometric curves
1.4 Forms and types of precipitation, characteristics of precipitation in India, measurement of precipitation
1.5 Recording and non-recording rain gauges, rain gauge station, rain gauge network
1.6 Estimation of missing data, presentation of rainfall data, mean participation
1.7 Area- duration relationship, frequency of point rainfall
1.8 Intensity –duration- frequency curves, probable max, precipitation

Unit-2: Evaporation & Transpiration:

2.1 Process, evaporimeters and empirical relationships
2.2 Analytical method, reservoir evaporation and methods of its control
2.3 Transpiration, evapo-transpiration and its measurement
2.4 Penman's equation and potential evapo-transpiration

Unit-3: Infiltration:

3.1 Infiltration process
3.2 Initial loss,
3.3 Infiltration capacity and measurement of infiltration
3.4 Infiltration indices.

PART-B

Unit-4: Runoff:

4.1 Factor affecting run-off, estimation of runoff, rainfall-run off relationships
4.2 Measurement of stage-staff gauge, wire gauge, automatic stage recorder and stage hydrograph
4.3 Measurement of velocity-current meters, floats ,area velocity method, moving boat and slope area method
4.4 Electromagnetic, ultra-sonic and dilution methods of stream flow measurement
4.5 Stage discharge relationship

Unit-5 Hydrograph:

5.1 Discharge hydrograph, components and factors affecting shape of hydrograph
5.2 Effective rainfall
5.3 Unit hydrograph and its derivation, unit hydrograph of different durations, use and limitations of UH
5.4 Triangular UH
5.5 Snyder's synthetic UH, floods, rational methods, empirical formulae
5.6 UH method, flood frequency methods
5.7 Gumbel's method, graphical method, design flood

Unit-6: Ground Water:

6.1 Occurrence, types of aquifers, compressibility of aquifers
6.2 Water table an, its effects on fluctuations
6.3 Wells and springs, movement of ground water
6.4 Darcy's law, permeability and its determination
6.5 Porosity, specific yield and specific retention, storage coefficient, transmissibility
6.6 Steady state flow to wells in unconfined and confined aquifers

Text/Reference Books:

1 K. Subramanya,2005, Engineering Hydrology, Tata McGraw-Hill Education
2 Santosh Kumar Garg,2006, Hydrology and Water Resources Engineering, Khanna Publishers
3 Dr. P. Jaya Rami Reddy, 2005, A Text Book of Hydrology,Firewall Media
4 H.M Raghunath, 2006, Hydrology: Principles, Analysis and Design, John Wiley & Sons

Software required / Web links:

http://nptel.ac.in/courses/105101002/
http://nptel.ac.in/courses/105103026/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (C-BCE-DS-603)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-603.1	3	2	1	1	2	-	-	-	-	-	-	2	3	1
BCE-DS-603.2	3	3	2	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-603.3	3	3	2	1	2	-	-	-	-	-	-	2	3	1
BCE-DS-603.4	3	3	2	1	2	-	-	-	-	-	-	2	3	1
BCE-DS-603.5	1	1	2	1	1	2	1	3	2	2	1	2	1	1
BCE-DS-603.6	1	1	2	3	2	2	2						3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-604A: CONSTRUCTION ENGINEERING & MANAGEMENT

Credits	3	Max. Marks	200
L-T-P	1-0-2	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Examination	100

Pre-requisites: None
Course Type: Program Core

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

BCE-DS-604A.1 Describe the process of project planning & management
BCE-DS-604A.2 Draw various networks for planning a project
BCE-DS-604A.3 Enumerate the types of prevalent construction methods and construction equipment.
BCE-DS-604A.4 relate the concept of Quality in Construction and the importance of Contracts.

PART A

Unit 1: Basics of Construction
1.1 Unique features of construction
1.2 Construction projects types and features
1.3 Phases of a project
1.4 Agencies involved and their methods of execution

Unit 2: Construction project planning
2.1 Stages of project planning
2.2 Process of development of plans and schedules, work break-down structure, activity lists
2.3 Assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data
2.4 Techniques of planning- Bar charts, Gantt Charts. Networks
2.5 Computation of float values, critical and semi critical paths, calendaring networks. PERT- assumptions underlying PERT analysis
2.6 Usage of MS Excel in making Progress Sheets and determining the Progress of the Project and its related activities with Bar Charts.

Unit 3: Construction Methods
3.1 Types of foundations and construction methods; Basics of Formwork and Staging
3.2 Common building construction methods
3.3 Modular construction methods for repetitive works and Precast concrete construction
3.4 Basics of Slip forming for tall structures, Steel Structures and Bridges

Unit 4: Construction Equipments
4.1 Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials.
4.2 Equipment Productivities
4.3 Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization
4.4 Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds
4.5 Cash flow, sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling- Bar chart, line of balance technique, resource constraints and conflicts resource aggregation, allocation, smoothening and leveling

4.6 Practice and understanding the concept of Scheduling and Cost Analysis on MS Excel, Microsoft Projects.

Unit 5: Project Monitoring & Control- Supervision

5.1 Record keeping, periodic progress reports, periodical progress meetings. Updating of plans: purpose, frequency and methods of updating. Common causes of time and cost overruns and corrective measures

5.2 Basics of Modern Project management systems such as Lean Construction; Use of Building Information Modeling (BIM) in project management

5.3 Quality control: concept of quality, quality of constructed structure, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control

5.4 Safety, Health and Environment on project sites: accidents; their causes, effects and preventive measures, costs of accidents, occupational health problems in construction, organizing for safety and health

5.5 Using BIM software to correlate the construction activities and planned activities.

Unit 6: Contracts Management and Importance of contracts

6.1 Types of Contracts, parties to a contract; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price. Performance parameters. Delays, penalties and liquidated damages

6.2 Force Majeure, Suspension and Termination. Changes & variations

6.3 Dispute Resolution methods

6.4 Construction Costs: Make-up of construction costs

6.5 Classification of costs, time cost trade-off in construction projects

6.6 Hands on Microsoft Project for analyzing the JCR and understating the concept of LOI.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

CO Statement (BCE-DS-604)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
BCE-DS-604A.1	2		1			2	3	2					3	2
BCE-DS-604A.2		1					2						2	3
BCE-DS-604A.3					2					3	2		3	2
BCE-DS-604A.4				2		2		3	2	3			3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-605A: DESIGN OF CONCRETE STRUCTURES

Credits	3	Max. Marks	200
L-T-P	2-0-2	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Examination	100

Prerequisite: None
Course Type: Program Core

Course Outcomes The student will be able to

BCE-DS -605A.1 Analyze the composite action of reinforced steel and concrete in reinforced concrete structural members
BCE-DS -605A.2 Design building components in accordance with IS-Codes
BCE-DS -605A.3 Utilize the relevant software to analyze and design of reinforced concrete members.
BCE-DS -605A.4 Draw reinforcement detailing of various structural components

PART-A

Unit 1: Working Stress Method:
1.1 Basic assumptions, permissible stresses in concrete and steel
1.2 Design of singly reinforced beams
1.3 Design of doubly reinforced beams
1.4 Design of T-beams

Unit 2: Limit State Method:
2.1 Basic assumptions
2.2 Design of singly reinforced beams
2.3 Design of doubly reinforced beams
2.4 Design of T-beams
2.5 Minimum and maximum reinforcement requirement
2.6 Design of a typical Beam section using Staad Pro/Etabs

Unit 3: Analysis and Design of Sections in shear, bond and torsion:
3.1 Diagonal tension, shear reinforcement,
3.2 Development length ,Anchorage and flexural bond
3.3 Torsional stiffness, equivalent shear, torsional reinforcement
3.4 Design a typical beam section on Staad pro
3.5 Draw a reinforcement detailing of shear reinforcement in Autocad

PART-B

Unit 4: Design of One way and Two Ways Slabs:
4.1 General considerations, Classification of Slabs
4.2 Design of one way slabs for distributed and concentrated loads
4.3 Design of two way slabs for distributed and concentrated loads
4.4 Design of a typical Slab section in Staad pro / ETabs
4.5 Draw a reinforcement detailing in Autocadd for a typical Slab section

Unit 5: Design of Columns:
5.1 General considerations, Classification of Columns
5.2 Effective length, Slenderness ratio, Minimum eccentricity

5.3 Design of Short columns under axial compression
5.4 Design of short column under uniaxial and biaxial bending
5.5 Design a typical Column section in Staad Pro
5.6 Draw a detailed drawing for reinforcements in Columns

Unit 6: Design of RCC Foundations:
6.1 Classification
6.2 Design of Isolated footings
6.3 Design of Rectangular Combined Footing
6.4 Concept of Raft foundation and Strap foundation
6.5 Sketch different types of Foundation in Auto Cadd
6.6 Design a typical RCC footing in ETabs/ Staad Foundatinon

Text/Reference Books:

1. P. Rajaratnam, "Design of Concrete Structures", OXFORD &IBH-PUBS COMPANY-NEW DELHI.
2. A.K. Jain "Limit state design", Nem Chand & Brothers.
3. Ramamrutham, "Design of Concrete Structures", Dhanpat Rai Publishing Company.
4. I.C.Syal&A.K.Goel , " Reinforced Concrete Structures", S. Chand.
5. IS 456-2000, Indian Standard Code of Practice for Plain & Reinforced Concrete.

Software required / Web links:
http://nptel.ac.in/downloads/105105104/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-605A)	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-605A.1	3	2	2	2	1	1	-	1	1	2	2	3	3	3
BCE-DS-605A.2	3	1	1	2	-	2	3	1	1	-	2	1	3	3
BCE-DS-605A.3	2	2	2	2	-	-	-	-	-	-	2	2	3	3
BCE-DS-605A.4	1	3	3	3	2	-	-	1	1	-	2	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-606: Environmental Engineering-II

Periods/week Credits	Max. Marks: 200
L: 2 T: 0 2	Internal/Continuous Evaluation: 100
Duration of Examination: 3 Hrs	External/ End Semester Examination: 100

Pre-requisites: None
Course Type: Program Core

Course Outcomes: The students will be able to

BCE-DS-606.1 Relate to the impact of humans on environment and vice-versa
BCE-DS-606.2 Apply basic environmental legislation.
BCE-DS-606.3 Select the most appropriate technique for the treatment of wastewater
BCE-DS-606.4 Recommend methodology for waste water treatment

PART-A

Unit 1: Air Pollution

1.1 Introduction and causes of air pollution,
1.2 Types of pollutants, their sources and impacts,
1.3 Air pollution meteorology, air pollution control,
1.4 Air quality standards and limits., plume behavior

Unit 2: Solid Waste

2.1 Sources of solid waste, types of solid waste
2.2 Waste composition and classification
2.3 Waste quantification
2.4 Landfilling of waste

Unit 3: Wastewater Engineering

3.1 An overview; constituents in wastewater, different sources of wastewater: domestic, industrial and storm water;
3.2 Types of sewerage and drainage system; Estimation of wastewater flow rates and its variations:
3.3 Estimation of peak, average and lean flow; drainage discharge; Hydraulics of sewers;
3.4 Design of wastewater collection systems; Design of storm water drains.

PART-B

Unit-4: Wastewater Characteristics

4.1 Physical, chemical and microbiological characteristics of wastewaters
4.2 typical characteristics of sewage: decay of sewage relative stability, population equivalent, effluent discharge standards;
4.3 Eutrophication; Response of streams to biodegradable organic waste: dissolved oxygen balance and its modelling, factor affecting steam flow rejuvenation

Unit-5: Treatment Processes

5.1 Primary, secondary and tertiary treatment;
5.2 Types of screens and its design, assessment of head loss through screen, grit chambers and its application, oil & grease removal
5.3 Design of primary and secondary clarifiers/ sedimentation tank;
5.4 Activated Sludge Process, Rotating Biological Contactors, Trickling Filters

Unit-6: Government Authorities & Their Role

6.1 Government authorities and their roles in water supply, sewerage disposal.
6.2 Solid waste management and monitoring/control of environmental pollution.

Text Books/ Reference Books:

1. MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.
2. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
3. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.
4. Sewage Disposal & Air Pollution Engineering, S.K.Garg, (2009)
5. Wastewater Engineering, Dr.B.C.Punmia, Er.Ashok Kumar Jain, Dr.Arun K.Jain, Laxmi Publications Private Limited

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-606)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-606.1	2		1			2	3	2					3	2
BCE-DS-606.2		1					2						2	3
BCE-DS-606.3					2					3	2		3	2
BCE-DS-606.4				2				3	2	3			3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BHM-MC-009: QUANTITATIVE APTITUDE & PERSONALITY DEVELOPMENT III

Periods/week	Credits	Max. Marks	: 100
P:2 T:0	AP	Continuous Evaluation	: 50
Duration of Exam: 2hrs		End Sem Exams	: 50

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

BHM-MC-009.1. Recognize problem based on Modern Mathematics and Algebra
BHM-MC-009.2. Solve basic to moderate level problems based on Mensuration and Geometry.
BHM-MC-009.3. Calculate solution to logical reasoning.
BHM-MC-009.4. Get proficient with resume building and will be able to draft effective cover letters.
BHM-MC-009.5. Participate effectively and confidently in a Group Discussion
BHM-MC-009.6. Manage interviews effectively.

PART-A

Unit 1: Modern Mathematics and Algebra

1.1 Permutation and Combination

1.1.1 Principal of counting and Basic formulas
1.1.2 Arrangements, Selection and Selection + Arrangement.
1.1.3 Linear/Circular arrangements, Digits and Alphabetic Problems and Applications.

1.2 Probability

1.2.1 Events and Sample Space, Basic Formulas.
1.2.2 Problems on Coins, Cards and Dices.
1.2.3 Conditional Probability, Bayes' Theorem and their Applications.

1.3 Algebra

1.3.1 Linear & Quadratic equations
1.3.2 Mathematical inequalities
1.3.4 Maximum & Minimum Values
1.3.3 Integral Solutions

Unit 2: Geometry and Mensuration

2.1 Geometry

2.1.1 Basic geometry & Theorems, Lines & Angles
2.1.2 Polygons, Triangle and Quadrilaterals
2.1.3 Circles

2.2 Mensuration I- Areas

2.2.1 Different types of Triangles and their area and perimeter.
2.2.2Different types of Quadrilateral and their area and perimeter.
2.2.3Circumference and Area of Circle, Area of Sector and length of Sector.
2.2.4Mixed Figures and their Applications.

2.3 Mensuration II- Surface Areas and Volumes

2.3.1 Problems on Cubes & Cuboids, Cone, Cylinder and Sphere.
2.3.2 Prism and Pyramid.
2.3.3 Mixed Figures and their Applications.

Unit 3: Logical Reasoning

3.1 Linear Arrangement
3.2 Circular Arrangement
3.3 Puzzles

Part-B

Unit 4: Professional Writing

4.1. Profiling on Social Sites: LinkedIn, Facebook, Instagram

4.2. Cover Letter/Emails
4.3. Resume Writing

Unit 5: Group Discussions
5.1. Do's and Dont's of a Group Discussion
5.2. Roles played in a Group Discussion
5.3. Tips for Cracking a Group Discussion

Unit 6: Managing Interviews
6.1. Developing the employability mindset
6.2. Preparing for Self -Introduction
6.3. Researching the employer
6.4. Portfolio Management
6.5. Answering Questions in an Interview

Text Books/Reference Books:
1. Arun Sharma, 2017, Teach Your Self Quantitative Aptitude: 1st Edition, McGraw Hills Education
2. R S Aggarwal, 2017, A Modern Approach to Logical Reasoning, S Chand & Company Pvt Ltd
3. Yana Parker & Beth Brown, The Damn Good Resume Guide
4. Ceri Roderick & Stephan, Lucks Interview Answers

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
Course Articulation Matrix

	PO 1	**PO 2**	**PO3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PS 1**	**PS 2**
BHM-MC-009.1	1	-	-	-	-	1	-	-	-	-	-	1	-	1
BHM-MC-009.2	1	-	-	-	-	1	-	-	-	-	-	1	-	1
BHM-MC-009.3	1	-	-	2	-	-	-	-	-	-	-	-	-	1
BHM-MC-009.4	-	-	-	-	-	-	-	1	-	3	-	1	-	2
BHM-MC-009.5	-	-	-	-	-	-	-	1	-	3	-	-	-	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A' Grade University

BHM-520: Entrepreneurship and Startups

Periods/week Credits	Max. Marks	: 200
L: 2 T: 0 2	Continuous Evaluation	: 100
Duration of Examination: 3 Hrs	End Term Examination	: 100

Pre-requisite:

Course Type: Humanities & Social Science

Course Outcomes: The course will enable the student to-

BHM-520.1. Acquire Entrepreneurialspiritandresourcefulness.
BHM-520.2. Understand theconceptandprocessofentrepreneurship-itscontributionandrole in thegrowthanddevelopmentofindividualsandthenation.

BHM-520.3. Strengthen the skillsofcreationandmanagementofentrepreneurialventure.

Unit1:IntroductiontoEntrepreneurshipandStart–Ups(6 Lectures)

Definition and Traitsofanentrepreneur,Intrapreneurship,Motivation, typesofBusinessStructures,Similarities/differencesbetweenentrepreneursandmanagers.

Unit2:BusinessIdeasandtheirimplementation(6 Lectures)

Discoveringideasandvisualizingthebusiness, Activitymap, BusinessPlan

Unit3:IdeatoStart-up and Management(7 Lectures)

MarketAnalysis–Identifyingthetargetmarket, CompetitionevaluationandStrategydevelopment, Marketingandaccounting, Riskanalysis, Company'sOrganizationStructure, Recruitmentandmanagementoftalent, financialorganizationandmanagement

Unit4:Financing,ProtectionofIdeas and Exit strategies(7 Lectures)

Financingmethodsavailableforstart-upsinIndia, CommunicationofIdeastopotentialinvestors–InvestorPitch, PatentingandLicenses

Text Books/ Reference books/Web references:

1. SteveBlankandBobDorf, 2020, TheStartupOwner'sManual:TheStep-by-StepGuideforBuildingaGreat Company,wiley.
2. Eric Ries, 2011, The Lean Startup: How Today's Entrepreneurs use ContinuousInnovationtoCreateRadicallySuccessfulBusinesses by EricRies, Penguin UK.

3. https://www.fundable.com/learn/resources/guides/startup

4.https://corporatefinanceinstitute.com/resources/knowledge/finance/corporate- structure/

5.https://www.finder.com/small-business-finance-tips

6.https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your- business

Distribution of Continuous Evaluation:

Sessional- I	30%
Sessional- II	30%
Assignment/Tutorial	20%
Class Work/ Quiz	20%

Evaluation Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

Assignments, Sessional and End Semester Examination paper will consist of various difficulty levels to accommodate the different capabilities of students. Assessment should cover all course outcomes and upper limit for lower order skills will be 40% (for knowledge-oriented questions). However, weightage for different cognitive levels in the question papers can vary.

Instructions for paper setting: The paper setter must ensure the coverage of entire syllabus while setting the question papers and mention the learning outcomes across each section to be measured by the examination. Weightage of the sections may vary as per the number of respective lecture hours mentioned in the syllabus.Action verbs should be used from Bloom's Taxonomy while designing question papers.

Course articulation Matrix

CO Statement	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
BHM520.1	-	-	-	-	-	-	-	1	2	2	2	2
BHM-520.2	-	-	-	-	-	-	-	1	2	3	2	2
BHM-520.3	-	-	-	-	-	-	-	1	2	3	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-621A: TRAFFIC ENGINEERING AND MANAGEMENT

Credits	**3**	**Max. Marks**	**200**
Lecture:2 Practical 2		**Internal/Continuous Evaluation**	**100**
Examination Duration	**3 hrs**	**External/ End Semester Exams**	**100**

NIL

Course Type: Domain Specific

Course outcomes: At the end of the course, the student will be able to

BCE-DS-621A.1. Comprehend the concept of different elements for traffic design.

BCE-DS-621A.2. Survey the various traffic related studies after having knowledge of these studies.

BCE-DS-621A.3. Make use of various traffic management techniques to control the traffic.

BCE-DS-621A.4 Implement PTV Vissim software to reduce traffic congestion.

PART-A

Unit-1: Elements of Traffic Engineering

1.1 Elements of Traffic Engineering road user, vehicle and road way
1.2 Vehicle characteristics, IRC standards, Design speed, volume
1.3 Highway capacity and levels of service
1.4 Capacity of urban and rural roads
1.5 PCU concept and its limitations
1.6 Road user facilities, Parking facilities, Cycle tracks and cycle way, Pedestrian facilities

Unit-2:Traffic studies

2.1 Traffic volume studies
2.2 Origin destination studies
2.3 Speed studies
2.4 Travel time and delay studies
2.5 Parking studies and delay studies

Unit-3: Traffic Control

3.1Traffic regulation and control
3.2 Signs and markings
3.3 Traffic signals
3.4 Pre-timed and traffic actuated
3.5 Rotary and intersections

PART-B

Unit-4: Traffic Management

4.1 Traffic management techniques
4.2 Local area management, Transportation system management
4.3 Low-cost measures, area traffic control
4.4 Various types of medium and long-term traffic management measures and their uses

Unit-5: Road Safety

5.1 Road safety issues and various measures for road safety
5.2 Engineering, education and enforcement measures for improving road safety
5.3 Short term and long-term measures, Road safety education and training
5.4 Traffic calming techniques and innovative ideas in road safety

Unit-6:PTV Vissim

6.1 Introduction to PTV Vissim software
6.2 Traffic Simulation Modelling
6.3 Use in Detect, Plan and Control traffic congestions
6.4 Next level Simulation

Text Books/ Reference Books:

1. ITE Hand Book, Highway Engineering Hand Book, McGraw,Hill.
2. BABKOV, V.F. ` Road conditions and Traffic Safety', MIR publications,1975.
3. R. J. Salter and N. B. Hounsel, Highway Traffic Analysis and Design, Macmillan Press Ltd, 1996.
4. K.W. Ogden, `Safer Roads – A Guide to Road Safety Engineering.' Averbury Technical, Ashgate Publishing Ltd., Aldershot, England, 1996.

Software required/Weblinks:

https://nptel.ac.in/courses/105101008/50
PTV VISSIM Software

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-621A)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-621A.1.	2	3	3	3	1	2	-	-	3	-	1	1	1	1
BCE-DS-621A.2.	2	3	3	2	2	-	2	2	-	-	-	-	3	3
BCE-DS-621A.3.	3	3	3	2	1	-	3	3	2	2	3	3	3	2
BCE-DS-621A.4.	3	3	3	1	3	1	2	-	-	-	-	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-622-GEOTECHNICAL DESIGN

Credits 3	Max. Marks : 200
L-T-P 3-0-0	Continuous Evaluation : 100
Examination Duration 3 hrs	End Semester Exam : 100

Pre-requisites: Geotechnical Engineering (BCE-DS-502)

Course Type: Domain Specific Elective

Course Outcomes At the end of this course, the student will be able to:
BCE-DS-622.1. Relate to technology in the Geotechnical field
BCE-DS-622.2. Explain basic principles of limit state design required for design of foundations.
BCE-DS-622.3. Apply Geotechnical concepts to design foundations.
BCE-DS-622.4. Solve foundation Design problems.
BCE-DS-622.5. Analyze Bridge substructure problems.
BCE-DS-622.6. Design retaining walls for real life scenarios.

PART-A

UNIT-I: Subsurface Site Evaluation
1.1 Geographical Investigation, Characterization of ground, site investigations,
1.2 Method of drilling, sampling.
1.3 In-situ tests: SPT, CPT, plates load tests, methods for ultimate bearing capacity based on in situ tests.
1.4 Location of water Table

Unit-II: Limit State Design-Basic Priciples
2.1 Introduction
2.2 Partial Safety Factors
2.3 Limit State of Collapse
2.4 Limit state of Serviceability
2.5 Design for shear and Torsion

UNIT-III Foundations
3.1 Introduction
3.2 Location and Depth of Foundation
3.3 Bearing Capacity of Soil
3.4 Settlement of Footings
3.5 Uplift capacity of footings
3.6 Structural Design

PART-B

UNIT-IV: FOUNDATION DESIGN-BASIC PRINCIPLES
4.1 Types of foundations
4.2 Selection and type of foundations
4.3 Basic requirements of foundations
4.4 Computation of loads
4.5 Design steps

UNIT-V: Bridge Substructures

5.1 Depth of foundation
5.2 Determination of Scour Depth
5.3 Allowable bearing pressure
5.4 Loads to be considered
5.5 Lateral stability of well foundation
5.6 Design of Pier cap and Pier

Unit-VI: Retaining Wall
6.1 Common Proportioning of retaining walls
6.2 Stability of Retaining walls
6.3 Structural Design of Retaining walls

Text/Reference Books:

1. S. Parkash and Gopal Ranjan, Analysis and Design of Foundation and Retaining Structures, Sarita Prakashan
2. B. M. Das, Advanced Soil Mechanics, McGraw Hills
3. Swami Saran, Analysis and Design of Substructures: Limit State Design, CBS Publishers and Distributors Pvt Ltd

Software required / Web links:
https://nptel.ac.in/courses/105105104/pdf/m11l29.pdf
https://nptel.ac.in/courses/105101083/download/lec18.pdf

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-622)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O 1**	**PS O 2**
BCE-DS-622.1	1	1	1	1	1	1		1	2	2	1	1	2	2
BCE-DS-622.2	3	3	3	1	1		1	1	2	2	1	1	3	3
BCE-DS-622.3	3	3	3	1	1			1	2	2	1	1	3	3
BCE-DS-622.4	3	3	3	1	1	1		1	2	2	1	1	3	3
BCE-DS-622.5	3	3	3	1	2			1	2	2	1	1	3	3
BCE-DS-622.6	3	3	3	1	2		1	1	2	1	3	1	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-623A: Construction Project Planning & Systems

Credits	**3**	**Max. Marks**	**200**
L-T-P	**2-0-2**	**Continuous Evaluation**	**100**
Examination Duration	**3 hrs**	**End Semester Examination**	**100**

Prerequisite: None
Course Type: Electives

Course Outcomes: At the end of the course, the student will be able to-
BCE-DS-623A.1. Discuss project preparation, Appraisal and Risk analysis with its types, measures & tools for assessment using Primavera and MS Project.
BCE-DS-623A.2. Identify Value analysis including job plan, function analysis, creative thinking, cost.
BCE-DS-623A.3.Summarize Modelling, life cycle costing, value engineering and management.
BCE-DS-623A.4.Report Project planning and scheduling with reference to scheduling tools like bar Chart and Network techniques such as CPM and PERT.

PART A

UNIT 1: Project Planning
1.1. Stages of project planning: pre-tender planning, pre-construction planning,
1.2. Detailed construction planning, role of client and contractor, level of detail.
1.3. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, estimating durations, sequence of activities, activity utility data.
1.4. Application of MS-Project and PrimaVera for planning
UNIT 2: Project Scheduling
2.1. Bar charts, Networks: basic terminology, single and overlapping relationships 2.2. preparation of CPM networks: activity on link and activity on node representation,
2.3. Analysis of single relationship (finish to start) networks, computation of float values, critical and semicritical paths, calendaring the events.
UNIT 3: Resource scheduling
3.1. PERT: Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion
3.2. Resource Scheduling: Bar chart, line of balance technique,
3.3. Resource constraints and conflicts, resource aggregation, allocation, smoothening and levelling.

PART-B

UNIT 4: Project budgeting
4.1. Project Costing and Budgeting Classification of costs, time cost trade-off in construction projects,
4.2. Compression and decompression. Preparing budgets, master networks.
4.3 Introduction of Rivet software in estimation.
UNIT 5: Project management
5.1. Need and application of systems approach,
5.2. Emergence of management thought, Theory by Fredrick Taylor, Henry Fayol,
5.3. Emergence of behavioural sciences, and that of the modern management thought.
UNIT 6: Application of IT in project management.
6.1 Need and nature of construction sector,
6.2. Scope and functions of construction management.
6.3. Spatial data management
6.4. Communication and computer network in construction Planning and management
Text Books / Reference Books:

1. Saleh A. Mubarak (2012); "Construction project scheduling and control" John Wiley & Sons. ISBN 13: 9780470919958. 480p.
2. James Lewis (2005); "Project Planning, Scheduling & Control, 4E: A Hands-On Guide to Bringing Projects in on Time and on Budget" McGraw-Hill Companies, Incorporated. . ISBN 13: 9780071460378. 510p.
3. Eric S. Norman, Shelly A. Brotherton, Robert T. Fried (2010); "Work Breakdown Structures: The Foundation for Project Management Excellence" John Wiley & Sons. ISBN 13: 9781118000267. 304p.
4. Project Management Institute (2006); "Practice Standard for Work Breakdown Structures'" Project Management Institute, ISBN 13: 9781933890135. 111p.

Software required/Weblinks:
https://nptel.ac.in/courses/105/103/105103093/
PRIMEVERA, MS Project, Rivet

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
Course Articulation Matrix

CO Statement (BCE-DS-623A)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO11	PO12	PSO 1	PSO 2
BCE-DS-623A.1	3	3	3	1	2	-	-	-	-	-	-	2	3	1
BCE-DS-623A.2	2	2	3	1	2	-	-	-	-	-	-	2	3	1
BCE-DS-623A.3	3	2	3	1	2	2	2	3	2	2	1	2	1	1
BCE-DS-623A.4	3	2	3	1	2	-	-	-	-	-	-	2	3	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-624: ENVIRONMENTAL SYSTEMS

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: None
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-624.1 Make use of the concept of environmental system analysis
BCE-DS-624.2 Apply the concept of environmental system analysis to real life problems
BCE-DS-624.3 Use cost-benefit analysis
BCE-DS-624.4 Evaluate mathematical models in planning and design of engineering problems
BCE-DS-624.5 Develop data collection techniques

PART-A

Unit 1: Introduction
1.1 Introduction to the concepts of environmentalsystems analysis

Unit 2: Applications
2.1 Applications of environmental systems analysis

Unit 3: Mathematical Modelling & Its Application
3.1 Application of mathematical programming and modeling to the design, planning and management of engineered environmental systems, regional environmental systems, and environmental policy

PART-B

Unit 4: Cost-Benefit Analysis
4.1 Economic analysis, including benefit-cost analysis andmanagement strategies.

Unit 5: Concept of Trade-offs
5.1 Concepts of tradeoff, non- inferior sets, single and multi-objectiveoptimization.

Unit 6: Practical Applications
6.1 Practical application to case studies to convey an understanding of thecomplexity and data collection challenges of actual design practice.

Text Books/ Reference Books:

1. Stefano MarsiliLibelli, Environmental System Analysis with MATLAB, CRC Press, Taylor & Francis Inc
2. Whitten Bentley, System Analysis and Design Methods, McGraw Hill-Irwin (https://inspirit.net.in/books/academic/System%20Analysis%20&%20Design%20Methods%20-%20Whitten.pdf)

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-624)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-624.1	1	-	1	-	2						2		1	2
BCE-DS-624.2	2				2	2			2			2	1	3
BCE-DS-624.3	2	3		2			2						1	3
BCE-DS-624.4								2		3			2	2
BCE-DS-624.5					2			2					2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-625- OPEN CHANNEL FLOW

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Introduction to Fluid Mechanics (BCE-DS-401)
Course Type: Domain Specific Elective

Course Outcomes At the end of this course, the student will be able to:
BCE-DS-625.1. Define different properties of fluid.
BCE-DS-625.2. Compare static forces of fluid
BCE-DS-625.3. Make relationships of Kinematics of Fluid Flow
BCE-DS-625.4. Evaluate dynamic forces of fluid flow
BCE-DS-625.5. Analyze basics of boundary layer theory and dimensional analysis
BCE-DS-625.6. Classify turbines, pumps, channels

PART- A

Unit I: Introduction
1.1 Fluid properties: mass density, specific weight, specific volume and specific gravity, compressibility
1.2 Surface tension, capillarity, pressure inside a droplet and bubble due to surface tension
1.3 Viscosity, Newtonian and Non-Newtonian fluids, real and ideal fluids

Unit II: Fluid Statics
2.1 Pressure-density-height relationship, gauge and absolute pressure
2.2 Simple differential and sensitive, manometers, two liquid manometers
2.3 Pressure on plane arid curved surfaces, center of pressure
2.4 Buoyancy, stability of immersed and floating bodies, determination of metacentric height
2.5 Fluids masses subjected to uniform acceleration, free and forced vortex.

Unit III: Kinematics of Fluid Flow
3.1 Steady & unsteady, uniform and non-uniform, laminar & turbulent flows, 1D, 2D &3D flows
3.2 Stream lines, streak lines and path lines
3.3 Continuity equation in differential form
3.4 Rotation and circulation, elementary explanation of stream function and velocity potential, rotational and irrotational flows
3.5 Graphical and experimental methods of drawing flow nets.

PART-B

Unit IV: Dynamics of Fluid Flow
4.1 Hydraulic and energy gradient lines
4.2 Head Losses in pipe lines
4.3 Concepts of equivalent lengths of pipes in parallel and series, branching of pipes and transmission of power through pipe lines.
4.4 Euler's equation motion along a streamline and its integration, limitation of Bernoulli's equation
4.5 Pitot tubes, Venturi-meter, Orfice-meter, flow through orifices & mouth pieces
4.6 Sharp crested weirs and notches, aeration of nappe.

Unit V: **Basics of Boundary layer theory and Dimensional Analysis**

5.1 Boundary layer thicknesses

5.2 Laminar boundary layer, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, local average friction coefficient, separation and its control.

5.3 Dimensional Analysis and Hydraulic Similitude Dimensional analysis

5.4 Buckingham theorem, important dimensionless numbers and their significance.

Unit VI: Basics of Fluid Machinery and OCF

6.1 Turbines: Classification and definitions, specific speed and unit quantities, working principles.

6.2 Classification, definitions, Centrifugal pumps: Various types and their important components, working principles, net positive suction head, specific speed; shut off head, cavitation.

6.3 Flow in open channels: classification of flows, Basic concepts, Resistance equations (Chezy's and Manning's formulae)

6.4 Efficient channel section

6.5 Specific energy concept critical flow and its computations.

Text/Reference Books:

1. R. K Bansal,2005, Textbook of Fluid Mechanics and Hydraulic Machines, Laxmi publications
2. D.S.Kumar,2012, Fluid Mechanics, S. K. Kataria& Sons
3. P. N. Modi & Seth, 2009, Hydraulics & Fluid Mechanics, Standard Book House
4. S.Nagaratnam, 1995, Fluid Mechanics, Khanna Publishers
5. M. K. Natarajan,1994, Principles of Fluid Mechanics, Oxford &IBH Publishing Co
6. Jagdish Lal,2001, Hydraulics and Fluid Mechanics, Tata McGraw Hill
7. V. L. Streete, 1998, Fluid mechanics, Tata McGraw Hill
8. Frank M. White, Fluid Mechanics, Tata McGraw Hill.
9. YunusCengel, Fluid Mechanics: Fundamentals and Applications, Tata McGraw Hill.
10. Pijush K. Kundu, Ira M. Cohen et al, Fluid Mechanics, Academic Press.

Software required / Web links

http://nptel.ac.in/courses/112105171/

http://nptel.ac.in/courses/112105183/

http://nptel.ac.in/courses/105101082/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-625)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-625.1	3	2	-	-	3	-	1	-	1	-	2	2	2	1
BCE-DS-625.2	3	3	-	1	3	-	-	-	-	-	-	1	3	2
BCE-DS-625.3	3	3	1	1	2	-	-	1	-	-	2	1	3	2
BCE-DS-625.4	3	3	-	2	3	-	1	1	1	-	1	2	3	3
BCE-DS-625.5	3	2	1	2	3	-	-	2	2	2	2	2	2	2
BCE-DS-625.6	3	3	1	2	3	1	-	2	2	-	2	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-626: RAILWAY ENGINEERING

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: None
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-626.1 Describe different components of Railways
BCE-DS-626.2 Illustrate different track layouts
BCE-DS-626.3 Enumerate the types of Railway works.
BCE-DS-626.4 Identify the requirements for track maintenance.
BCE-DS-626.5 Analyze the concept of movement of trains on tracks.
BCE-DS-626.6 Relate the concept of High-speed trains.

PART-A

Unit 1: Railway track
1.1 Gauge, alignment of railway lines
1.2 Engineering surveys and construction of new lines
1.3 tracks and track stresses
1.4 rails
1.5 sleepers
1.6 ballast

Unit 2: Subgrade and formation
2.1 Rack fittings and fastenings
2.2 creep of rails

Unit 3: Geometric design of track
3.1 curves and super-elevation
3.2 points and crossings
3.3 track junctions and simple track layouts
3.4 rail joints and welding of rails

Unit 4: Track maintenance
4.1 track drainage
4.2 modern methods of track maintenance
4.3 rehabilitation and renewal of track

Unit 5: Tractive resistance and power
5.1 railway stations and yards
5.2 railway tunneling

Unit 6: Signaling and interlocking
6.1 maintenance of railways
6.2 high speed trains

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-626)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-626.1		1		1		2	3	3					3	2
BCE-DS-626.2	2		1			2	3	2					3	2
BCE-DS-626.3					2					3	2		3	2
BCE-DS-626.4				2				3	2	3			3	3
BCE-DS-626.5								3				2	3	2
BCE-DS-626.6				2				3	2	3			3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-627A: DESIGN OF STEEL STRUCTURES

Credits	3	Max. Marks	200
L-T-P	2-0-2	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Examination	100

Pre-requisites: Engineering Mechanics
Course Type: Domain Specific Elective
Course Outcomes: The Student will be able to

BCE-DS-627A.1. Analyze material properties as used in steel structures
BCE-DS-627A.2. Evaluate the various types of joints to be used in steel design
BCE-DS-627A.3. Develop optimal design of steel columns, flexural members, Gantry Girder, Industrial buildings
BCE-DS-627A.4. Utilize the relevant software to analyze and design of Steel Member

PART-A

Unit 1: Properties of materials
1.1 Properties of materials; loads and stresses
1.2 Design of semi-rigid,rigid and moment resistant connections
1.3 Demonstration of Design of Connections in Staad Pro

Unit 2: Built-up sections
2.1 Built-up sections Design of tension members
subjected to axial tension and bending, splicing of tension member
2.2 Design of an I section Beam member using Staad Pro

Unit 3: Design of compression members
3.1 Design of compression members, Beam-column connections, Design of columns and their bases
3.2 Design of a Compression member in Staad Pro
3.3 Drawing a Beam Column connection in Autocad

PART-B

Unit 4: Design of flexural members
4.1 Design of flexural members and Plate girder; loads, specification
4.2 Design a Typical section in Staad Pro/ ETabs

Unit 5: Design Industrial buildings
5.1 Design Industrial buildings; loads, design of purlins, trusses, bracings
5.2 Design of a typical Truss section using Staad Pro
5.3 Design of Purlins in Staad Pro / ETabs

Unit 6: Gantry girders
6.1 Gantry girders
6.2 Modelling of a Gantry Girder in Staad Pro
6.3 Design of a typical Gantry Girder in Staad Pro

Text Books/ Reference Books:

1. Segui, W. T., LRFD Steel Design, 2nd Ed., PWS Publishing, Boston.

2. Salmon, C.G. and Johnson, J.E., Steel Structures: Design and Behavior, 3rd Edition, Harper & Row, Publishers.

Software required/Weblinks:

https://nptel.ac.in/
https://swayam.gov.in/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-627A)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
BCE-DS-627A.1	3	3	2	3	2	-	2	2	-	-	1	2	1	2
BCE-DS-627A.2	3	2	-	3	2	-	3	1	3	-	1	2	3	2
BCE-DS-627A.3	3	-	-	2	1	2	3	3	2	1	-	3	3	2
BCE-DS-627A.4	3	2	3	2	2	-	-	-	-	-	-	2	3	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-628: SOIL MECHANICS

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: None
Course Type: Program Elective
Course Outcomes: The student will be able to

BCE-DS-628.1. Relate to problems of stability of slopes
BCE-DS-628.2. Explain concept of earth pressure theories
BCE-DS-628.3. Utilize knowledge about sheet piles
BCE-DS-628.4. Develop knowledge about excavation and brace-cuts
BCE-DS-628.5. Design retaining walls according to codal provisions.
BCE-DS-628.6. Discuss advance instruments used in exploration of soil.

PART-A

UNIT-I Stability of slopes:
1.1 Stability of finite and infinite slopes
1.2 Types of failures & different factors of safety
1.3 Determination of factor of safety by method of slices, Swedish circle, friction circle
1.4 Fellenius method for locating center of critical slip circle
1.5 Stability analysis of side slopes of earth dam slopes for different conditions.

UNIT-II: Earth pressure:

2.1 Different types of earth pressures
2.2 States of plastic equilibrium
2.3 Rankine's theory and Coulomb's theory
2.4 Influence of water table, surcharge, wall friction and deformation on the earth pressure,
2.5 Application of Rankine's and Coulomb's theory to cohesionless and cohesive soils

Unit-III Site Investigation
3.1 Planning a subsurface exploration programme
3.2 Stages in subsoil exploration
3.3 Borings for exploration
3.4 Standard Penetration Test
3.5 Plate Load Test
3.6 Electrical Resistivity Test

PART B

UNIT-IV: Braced cut:
4.1 General Considerations
4.2 Lateral earth pressure distribution on braced cuts
4.3 Stability of braced cuts in saturated clay
4.4 Piping Failure in sand cuts

UNIT-V: Machine Foundation
5.1 Introduction
5.2 Types of machine foundations

5.3 Degree of freedom of block foundation
5.4 Vibration analysis of machine foundation

UNIT-VI: Advance Measuring Instruments
6.1 Electronic consolidation apparatus,
6.2 Electronic direct shear apparatus,
6.3 Electronic triaxial apparatus
6.4 Hydraulically operated triaxial cell
6.5 Vibrating- Wire Extensometer

Text/Reference Books:

1. S. Parkash and Gopal Ranjan, Analysis and Design of Foundation and Retaining Structures, Sarita Prakashan
2. B. M. Das, Advanced Soil Mechanics, McGraw Hills
3. Swami Saran, Soil Dynamics, I. K. International Publishing Pvt Ltd.
5. Alam Singh, Soil Mechanics, Asia Publishing House
5. K. R. Arora, Soil Mechanics & Foundation Engineering, Standard Publisher
6. Dr. B.C.Punmia, Soil Mechanics & Foundation Engineering, Fireball Media
7. M. J. Tomlinson, Foundation Design and Construction
8. Joseph Bowles, Foundation Analysis and Design, 2001

Software required / Web links:
http://nptel.ac.in/courses/106137120/
https://nptel.ac.in/courses/105104137/module7/lecture24.pdf

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-628)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
BCE-DS-628.1	3	3	3	3	2	-	-	2	-	-	1	2	1	2

BCE-DS-628.2	3	2	-	3	2	-	3	1	3	-	1	2	3	2
BCE-DS-628.3	3	-	-	2	2	2	3	3	2	-	-	2	3	2
BCE-DS-628.4	3	2	3	2	2	-	-	-	-	1	-	2	3	1
BCE-DS-628.5	3	3	3	3	3	-	-	-	-	1	-	2	3	2
BCE-DS-628.6	1	1	1	1	2	3	2	3	3	3	3	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-629: Prefabricated Structures
Proposed Syllabus(will be put up for approval in next BOS)

Periods/week	Credits	Max. Marks: 200
L: 3 T: 0	3	Continuous Evaluation:100
Duration of Examination: 3 Hours		End Semester Exams: 100

Course Outcomes:

After the completion of course, students will be able:

BCE-DS-629.1 – To learn basic principles and standardization regarding Prefabricated Buildings.

BCE-DS-629.2 – To understand different components of Prefabricated Structures.

BCE-DS-629.3 – To undergo various Design Philosophies followed in the design of components of a Prefabricated Structure.

BCE-DS-629.4 – To design the connections for Prefabricated Structures.

BCE-DS-629.5 – To experience the effects of Lateral Loads on Prefabricated Structures using FEA software.

PART-A

Unit 1: Basic Introduction

1.1. Introduction to Prefabricated Structures
1.2. Principles of Prefabrication
1.3. Standardizations and Codal Provisions
1.4. Transportation and Erection
1.5. Case Studies

Unit 2: Components of a Prefabricated Structure

2.1. Types of Structural Components
2.2. Roof Panel Systems
2.3. Wall Panel Systems
2.4. Beams and Columns
2.5. Shear Walls

Unit 3: Design Philosophies

3.1. Design of cross section
3.2. Concept of Joint Flexibility
3.3. Allowance for joint deformation
3.4. Demountable precast concrete systems

PART-B

Unit 4: Connections in Prefabricated Structures

4.1. Types of Connections
4.2. Types of Joints
4.3. Design of Expansion Joints
4.4. Types of Sealants

4.5. Structural Detailing

Unit 5: Lateral Loads on Prefabricated Structures

5.1. IS Codal Provisions
5.2. Effect of Wind Forces on Prefabricated Structure
5.3. Effect of Seismic Forces on Prefabricated Structure
5.4. Design of Wind Loads on Prefabricated Tower Systems
5.5. Design of Seismic Loads on Prefabricated Engineered Building

Unit 6: Sustainable Development Goals and FEM Analysis

6.1. Correlation of Prefabricated Structure and SDGs 2030
6.2. FEM Analysis of a Prefabricated Engineered Building
6.3. FEM Analysis of a Prefabricated Tower Systems

Text Books/ Reference Books:

1. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.
2. Bachmann, H. and Steinle, A. "Precast Concrete Structures", Ernst & Sohn, Berlin, 2011.
3. Netherland Betor Verlag, Structural design manual", Precast concrete connection details, Society for the studies in the use of precast concrete, 2009.
4. Bruggeling A.S. G and Huyghe G.F. "Prefabrication with Concrete", A.A. Balkema Publishers, USA,1991

Software required/Weblinks

https://nptel.ac.in/courses/124105013

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

COURSE ARTICULATION MATRIX

CO Statement (BCE-DS-629)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
BCE-DS-629.1	3	3	2	1	2	1	-	2	2	-	1	2	3	1	2	2
BCE-DS-629.2	3	3	2	1	2	-	1	-	1	2	1	2	3	1	1	1
BCE-DS-629.3	3	3	2	1	2	-	1	1	1	-	1	2	3	1	2	2
BCE-DS-629.4	3	3	2	1	2	-	1	1	1	2	2	2	3	1	2	2
BCE-DS-629.5	3	3	2	1	2	2	3	-	1	-	1	2	3	1	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-630: BUILDING INFORMATION MODELLING

Periods/week Credits **Max. Marks: 200**
L: 03 T: 0 3 **Internal/Continuous Assessment: 100**
Duration of Examination: 3 Hrs **End Semester Exam : 100**

Pre-requisites: None
Course Type: Program Elective

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

BCE-DS-630.1 Apply knowledge of mathematics, science, and engineering and familiar with current BIM technologies
BCE-DS-630.2 Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
BCE-DS-630.3 Understand new means of coordination and collaboration of design and construction
BCE-DS-630.4 Use the techniques, skills, and modern engineering tools necessary for engineering practice

PART-A

Unit-1: Introduction
1.1 Introduction to Building Information Modelling (BIM)
1.2 Definition of BIM and Identification of BIM Objectives
1.3 Historical Background, Benefits of BIM.

Unit-2: Impacts of BIM
2.1 Roles and Impacts of BIM in Design
2.2 Impacts of BIM in Construction Engineering
2.3 Impacts of BIM in Facility Management

Unit-3: Structural System

3.1 Revit Architecture and Structure
3.2 MEP
3.3 Creating Sets, Building Elements,
3.4 Structural Systems, and MEP Systems

PART-B

Unit-4: BIM Application in Capital Projects
4.1 BIM and Construction Cost Estimating and Scheduling
4.2 Perform model-based cost estimating
4.3 Apply BIM to reduce error and change orders in capital projects

Unit-5: BIM and Project Delivery
5.1 BIM and Clash Detection
5.2 Perform 4D simulations
5.3 Integrated Project Delivery (IPD)

Unit-6: Life Cycle Assessment
6.1 Describe workflow in using BIM in the building lifecycle
6.2 Evaluate and communicate your ideas related to the use of BIM in the building life cycle
6.3 Future of Building Information Modelling

Text Books/ Reference Books:

1. Eastman, C., Teicholz, P., Sacks, R., & Liston, C., BIM handbook: A guide to building information modelling for owners, managers, designers, engineers and contractors, John Wiley & Sons, 2011.
2. Krygiel, E., & Nies, B., Green BIM: successful sustainable design with building information modelling. John Wiley & Sons, 2008.
3. Kymmell, W., Building Information Modeling: Planning and Managing Construction Projects with 4D CAD and Simulations (McGraw-Hill Construction Series), McGraw Hill Professional, 2007.
4. Issa, R. R., & Olbina, S. (Eds.), Building Information Modeling: Applications and Practices. American Society of Civil Engineers 2015.
5. Duell, R., Hathorn, T, and Hathorn, T.R., Autodesk Revit Architecture 2016 Essentials, Wiley and Sons, Inc, 2015.
6. Eynon, J., Construction Manager's BIM Handbook. John Wiley & Sons, 2016.
7. Teicholz, P. (Ed.), BIM for facility managers. John Wiley & Sons, 2013.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-630)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-630.1	3	3	2	3	2	3	3	-	2	-	1	-	3	3
BCE-DS-630.2	3	2	3		2	1	3	1	-	2	-	-	3	3
BCE-DS-630.3	3	-	3	2	2	3	-	-	1	-	3	3	3	3
BCE-DS-630.4	3	2	-	3	-	3	3	1	-	1	3	-	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A' Grade University

HM-606 : French-II

Periods/week Credits	Max. Marks	: 100
L: 2 T: 0 2	Continuous Evaluation	: 50
Duration of Examination: 1.5 Hrs	End Sem Examination	: 50

Pre-Requisites: Basic knowledge of grammatical structure, syntax, and vocabulary of French
Course Type: Humanities and Social Sciences

Course Outcomes: Students will be able to-

HM-606.1. Exchange greetings and do introductions using formal and informal expressions. Understand and use interrogative and answer simple questions.

HM-606.2. Learn basic vocabulary that can be used to discuss everyday life and daily routines, using simple sentences and familiar vocabulary. Express their likes and dislikes. Also will have understanding of simple conversations about familiar topics (e.g., greetings, weather and daily activities,) with repetition when needed.

HM-606.3. Identify key details in a short, highly-contextualized audio text dealing with a familiar topic, relying on repetition and extra linguistic support when needed. Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary.

HM-606.4. Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary. Provide basic information about familiar situations and topics of interest.

HM-606.5. Express or/and justify opinions using equivalents of different verbs. Differentiate certain patterns of behavior in the cultures of the French-speaking world and the student's native culture.

HM-606.6. Describe various places, location, themselves using simple sentences and vocabulary.

PART – A

Unit 1- Se présenter (1)

1.1 Les pluriels
1.2 Adjectives to describe a person

Unit 2- Se présenter (2)

2.1 Professions
2.2 Short essay on family & friend
2.3 Comprehension

Unit 3- Parler de ses habitudes quotidiennes

3.1 Les verbes pronominaux
3.2 Décrivez votre journée

PART – B

Unit 4- Nommez et localiser des lieux dans la ville

4.1 Prepositions
4.2 Asking & telling the way

Unit 5- Informations simples sur le climat, la météo
5.1 Les saisons
5.2 Les expressions de la saison
5.3 Comprehension

Unit 6- Demander/ indiquer les horaires et les couleurs
6.1 Timings
6.2 Colours

Text Books/Reference Books/ Suggested Readings:

1. Annie Berthet, Catherine Hugot, Veronique M Kizirian,2006, Alter Ego Level One Textbook, Hachette Publications.
2. Mahitha Ranjit, 2016, Apprenons Le Francais II & III, Saraswati Publications.

Weblinks:
www.bonjourfrance.com
www.allabout.com

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
COURSE ARTICULATION MATRIX :

CO Statement (HM–606)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O 1**	**PS O 2**
HM-606.1	-	-	-	-	-	1	-	-	1	1	-	1	-	-
HM-606.2	-	-	-	-	-	1	-	-	1	1	-	-	-	-
HM-606.3	-	-	-	-	-	1	-	-	1	1	-	-	-	-
HM-606.4	-	-	-	-	-	1	-	-	1	1	-	-	-	-
HM-606.5	-	-	-	-	-	1	-	-	1	1	-	1	-	1
HM-606.6	-	-	-	-	-	1	-	-	1	1	-	-	-	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A' Grade University

HM-607 : GERMAN – II

Periods/week	Credits	Max. Marks	: 100
L: 2 T: 0	2	Continuous Evaluation	: 50
Duration of Examination: 1.5 Hrs		End Sem Examination	: 50

Pre-Requisites: Students are expected to have basic knowledge of German grammar. They should know regular verbs and conjugations. They should be able introduce themselves and make small sentences in German language.

Course Type: Humanities and Social Sciences

Course Outcomes: Students will be able to-

HM-607.1. Discuss about various directions, countries and languages they speak.
HM-607.2. Write short essays on family and friends. They will have knowledge of tenses.
HM-607.3. Identify classroom vocabulary in the German language.
HM-607.4. Speak ordinal and cardinal numbers and they will also learn months, days in German.
HM-607.5. Express or/and justify opinions using equivalents of different verbs.
HM-607.6. Describe themselves, other people, familiar places and objects in short discourse using simple sentences and basic vocabulary.

PART – A

Unit 1: Ordinal und Kardinal Zahlen,

1.1 Ordinal & Cardinal numbers
1.2 Months, days, Feiertage and dates

Unit 2: sein und haben

2.1 Verbs: to be and to have
2.2 helping verbs practice worksheets
2.3 Vocabulary (Family) short essay on family, friends etc.

PART – B

Unit 3: Gegenstände im Kursraum

3.1 Vocabulary (classroom)
3.2 Definite and indefinite articles

Unit 4: Länder, Sprachen

4.1 Countries, languages, directions
4.2 Past of the verb ‘to be’

Text Books/Reference Books:

1. Rita Maria Niemann,Cornelsen, 2005, Studio d A1: Deutsch alsFremdsprache, Volume 6.
2. Dallapiazza, Rosa-Maria and Jan, Eduard von. Tangram aktuell 1. Deutsch alsFremdsprache Tangram aktuell 1 - Lektion 1-4: Deutsch als. (HueberVerlag, 2005).
3. Dallapiazza, Rosa-Maria and Jan, Eduard von. Tangram aktuell 1. Deutsch alsFremdsprache Tangram aktuell 1 - Lektion 5-8: Deutsch als. (HueberVerlag, 2005).
4. Paul Rusch, 2015: Langenscheidt and Klett.

Weblinks:
http://www.nthuleen.com/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Student needs to attempt four questions from the remaining six questions. Five questions need to be attempted in total. Each question will be of 10 marks.

Evaluation Tools:
Sessional tests
End Semester Examination scores
Participation in class activities
Home assignments
Class attendance

COURSE ARTICULATION MATRIX :

CO Statement (HM–607)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
HM-607.1	-	-	-	-	-	1	-	-	1	1	-	1	-	-
HM-607.2	-	-	-	-	-	1	-	-	1	1	-	-	-	-
HM-607.3	-	-	-	-	-	1	-	-	1	1	-	-	-	-
HM-607.4	-	-	-	-	-	1	-	-	1	1	-	-	-	-
HM-607.5	-	-	-	-	-	1	-	-	1	1	-	1	-	1
HM-607.6	-	-	-	-	-	1	-	-	1	1	-	-	-	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

NAAC 'A' Grade University

HM-608 : SPANISH – II

Periods/week Credits	Max. Marks	: 100
L: 2 T: 0 2	Continuous Evaluation	: 50
Duration of Examination: 1.5 Hrs	End Sem Examination	: 50

Pre-Requisites: Students are expected to have basic knowledge of Spanish Grammar. They should be able to understand Spanish language along with basic skills for communication. Students are also expected to have basic knowledge of Spanish Culture.

Course Type: Humanities and Social Sciences

Course Outcomes: Students will be able to-

HM-608.1. Know about various color names in Spanish along with various vocabularies related to cloths and wardrobe.

HM-608.2. Differentiate between Ser and Estar verbs along with uses.

HM-608.3. Understand adjectives along with telling time.

HM-608.4. Learn Count till 1000

HM-608.5. Acquire knowledge of regular –ER and –IR verbs along with its various uses.

HM-608.6. Assess knowledge of vocabulary related to family and marital status.

PART – A

Unit 1 : Color and Clothing

1.1 Introduction of colors

1.2 Vocabulary related to clothes and wardrobe

Unit 2 : Ser, Estar and Haber

2.1 Difference between the use of Verbo SER and ESTAR and their use with the similar adjective.

2.2 Introduction of Verbo HABER

PART – B

Unit 3 : Adjective, Counting and Time

3.1 Demonstrative adjectives

3.2 Counting till 1000

3.3 Time

Unit 4 : Verb ER and IR and Family

4.1 Introduction and Usage of –ER Verbs

4.2 Introduction and Usage of –IR Verbs

4.3 Vocabulary related to the family and marital status

Text Books/Reference Books:

1. Eric V Greenfield, 1971, Barnes and Noble.
2. Nuevo Espanol sin fronteras, Jesus Sanchez Lobato and Isabel Santos Gargallo, 2005, Goyal Saab, ELE & SGEL.

Weblinks:

http://studyspanish.com/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
COURSE ARTICULATION MATRIX :

CO Statement (HM-608)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
HM-608.1	-	-	-	-	-	1	-	-	1	1	-	1	-	-
HM-608.2	-	-	-	-	-	1	-	-	1	1	-	-	-	-
HM-608.3	-	-	-	-	-	1	-	-	1	1	-	-	-	-
HM-608.4	-	-	-	-	-	1	-	-	1	1	-	-	-	-
HM-608.5	-	-	-	-	-	1	-	-	1	1	-	1	-	1
HM-608.6	-	-	-	-	-	1	-	-	1	1	-	-	-	1

SEMESTER-VII

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

PROJ-CE-710: Summer Internship-III

Periods/week Credits Max. Marks : 100
4 weeks Minimum 2.0 Continuous Evaluation : 100
Duration of Exam: 2 Hrs

Course Type: Projects

Course Outcomes: After completion of this course the students will be able to
Proj-CE-710.1. actually face challenges of real field work.
Proj-CE-710.2. apply their learning skills to solve real life problem.
Proj-CE-710.3. Show the research capability.
Proj-CE-710.4. enhance their Innovative skills.
Proj-CE-710.5. develop solutions.
Proj-CE-710.6. build technology for new areas.

Every student will have to undergo Industrial Training for 6 weeks in the relevant field of Engineering in which he/she is enrolled for B.Tech programme after 6th semester. Respective Head of Department will approve the Industry/Organization for training. During this course of time he/she will be regularly monitored and evaluated. After successful completion of the training, the student will have to submit the training report, deliver a seminar about the work/project undertaken during the training and will have to appear for viva. The evaluation of the industrial training shall be made as per following:

Continuous Evaluation during training:
1. Evaluation by the Supervisor in the Industry : 50 marks
2. Evaluation by Faculty Mentor during training visit : 20 marks
3. Internal/Continuous Evaluation: seminar/ Presentation : 30 marks

Total Marks : **100**

End Semester Exam : Evaluation after training:
1. Project Report : 30 marks
2. Seminar/Presentation : 40 marks
3. Viva : 30 marks

Total marks **100**

Total Credits : 2

COURSE ARTICULATION MATRIX :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Proj-CE-710.1	1	2	3	-	-	-	2	2	3	3	2	3	1	2
Proj-CE-710.2	1	3	3	-	-	-	2	3	3	2	2	3	1	2
Proj-CE-710.3	2	-	-	-	-	-	2	1	2	3	2	3	1	2
Proj-CE-710.4	1	-	-	-	-	-	2	1	3	3	2	3	1	2
Proj-CE-710.5	2	-	-	-	-	-	2	2	3	2	2	3	2	-
Proj-CE-710.6	1	-	-	-	-	-	2	2	3	2	2	3	1	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

PROJ-CE-700A: PROJECT PHASE- II

Credits 5		Max. Marks	: 300
Practical/Week 0-0-8		Continuous Evaluation	: 200
Examination Duration	2 hrs	End Semester Exam	: 100

Pre-requisites: Project Phase-I (PROJ-CE-600)
Course Type: Project

Course outcomes: At the end of the course, student will be able to

PROJ-CE-700A.1. Develop study and research literature
PROJ-CE-700A.2. Conduct Laboratory / Field Studies
PROJ-CE-700A.3. Solve complex Civil Engineering problems by applying appropriate techniques and tools.
PROJ-CE-700A.4. Exhibit good communication skill to the engineering community and society.
PROJ-CE-700A.5. Master the art of working in group and learning professional ethics
PROJ-CE-700A.6. Develop understanding of technical dissertation presentation and writing.

Syllabus Contents:

Project Phase-II will be extension of the work on the topic identified in Project Phase– I.
Continuous Evaluation should be done of the work done by adopting the methodology involving conduct of experiments, collection and analysis of data, etc. There will be pre submission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.

Assessment Tools:

Mid-Term presentation
Guide's continuous comprehensive assessment
Term end presentation

Distribution of Continuous Evaluation:

Presentation/Viva	40%
Report	20%
Class Work/ Performance	20%
Attendance	20%

Course Articulation Matrix

CO Statement (PROJ-CE-700A)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
PROJ-CE-700A	3	1	1	1	1	1	3	1	1	1	1	1	3	3
PROJ-CE-700A	2	-	-	-	-	1	3	-	-	-	-	-	2	2

PROJ-CE-700A	3	2	1	1	1	2	1	1	1	1	1	1	3	3
PROJ-CE-700A	-	3	3	3	1	-	-	3	3	1	3	1	2	2
PROJ-CE-700A	-	3	3	3	2	-	1	3	3	2	3	2	1	1
PROJ-CE-700A	-	1	3	3	3	-	1	3	3	3	3	3	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

PROJ-CE-700: General Proficiency

Grades to be Awarded based on Student's Achievements
Audit Pass Course.

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-702A: Structural Analysis II

Credits	3	Max. Marks	200
L-T-P	2-0-2	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Examination	100

Pre-requisites: None
Course Type: Program Core

Course Outcomes:
BCE-DS-702A.1 Correlate the behavior of real-life frame structures
BCE-DS-702A.2 Analyze the structural behaviour of elements subjected to moving loads
BCE-DS-702A.3 Illustrate behaviour in influence line diagram in structural Analysis of truss and archs.
BCE-DS-702A.4 To make the student familiar with latest computational techniques and software used for structural analysis.

PART A

Unit 1: Analysis of Frames

1.1 Analysis of building frames
1.2 Kani's moment distribution and other methods
1.3 Approximate methods;
1.4 Verify BMD and SFD by Staad Pro.

Unit 2: Stiffness Matrix Method

2.1 Stiffness matrix method
2.2 Application to simple problems of beams
2.3 Application to simple problems of frames
2.4 Verify BMD and SFD by Staad Pro

Unit 3: Flexibility Method
3.1 Flexibility matrix method
3.2 Application to simple problems of beams
3.3 Application to simple problems of frames
3.4. Verify BMD and SFD by Staad Pro

PART B

Unit 4: Moving Loads
4.1 Moving loads for determinate beams
4.2 Different load cases
4.3 Moving loading in Staad Pro.

Unit 5: Influence Line Method
5.1 Influence lines for forces for determinate beams

5.2 Influence lines for pin-jointed trusses
5.3 Influence lines for indeterminate beams using Muller Breslau principle.
5.4. ILD by Staad Pro.

Unit 6: Arches
6.1 Influence lines for Arches
6.2 stiffening girders
6.3. ILD by Staad Pro.

Text/ Reference Books:

1. Vazirani&Ratwani et al ," Analysis of Structures " Vol 1&2, Khanna Publishers
2. L.S Negi & R.S. Jangid, "Structural Analysis", Tata McGraw Hill
3. S.B. Junnarkar Dr. H. J. Shah "MECHANICS OF STRUCTURES" VOL. II, Charotar Publishing House.
4. Hibbler,"Structural Analysis", Pearson Education.
5. Reddy, C.S, "Basic Structural Analysis", Tata McGraw Hill.
6. C. K. Wang, "Indeterminate Structural Analysis"
7. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
8. P. Dayaratnam, "Analysis of Statically Indeterminate Structures" East West Press
9. S. P. Timoshenko and D. Young, "Theory of Structures" Mc-Graw Hill Book Publishing Company Ltd.

Software required / Web links:
Staad Pro V8i
http://nptel.ac.in/courses/105101085/
http://nptel.ac.in/courses/105105109/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
Course Articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-702A.1	3	3	2	1	2	-	-	-	-	-	-	2	3	2
BCE-DS-702A.2	3	3	2	1	2	-	-	-	-	-	-	2	3	2
BCE-DS-702A.3	3	3	2	1	2	-	-	-	-	-	-	2	3	2
BCE-DS-702A.4	3	3	2	1	2	-	-	-	-	-	-	2	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-703A: FOUNDATION ENGINEERING

Credits	3	Max. Marks	200
L-T-P	2-0-2	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Examination	100

Pre-requisites: None
Course Type: Program Core
Course Outcomes The student will be able to

BCE-DS-703A.1. Relate to various foundations and their purpose
BCE-DS-703A.2. Apply knowledge about bearing capacity, settlement and design of various foundations
BCE-DS-703A.3. Evaluate slope stability of finite and infinite slopes
BCE-DS-703A.4. Perform analysis using software for various research works and projects.

PART-A

UNIT-I: Foundations
1.1 Concept of shallow and deep foundation
1.2 Types of shallow foundations and their suitability
1.3 Factors affecting the depth of shallow foundations
1.4 Dewatering of foundations

Unit-II: Bearing Capacity and Settlement of Foundations
2.1 Bearing capacity & various factors affecting bearing capacity
2.2 General, local and shear failures
2.3 Settlement of footings
2.4 Plate load test (no procedure details) and interpretation of its results, limitations of plate load test
2.5 SPT Test, Procedure, correction applied & Application of SPT
2.6 IS method of finding bearing capacity of soil
2.7 Basic design problems of shallow and deep foundations using PLAXIS / GEO5.

UNIT-III Pile Foundation
3.1 Type of piles and their suitability;
3.2 constructional features of pile foundations,
3.3 Pile classification on the basis of material, method of load transmission, method of installation. selection of foundation type
3.4 Pile Load Tests
3.5 Under- reamed pile foundations
3.6 Design and analysis of pile foundations using PLAXIS/ GEO5

PART-B

UNIT-IV: Sheet plies:
4.1 Different types of sheet pile walls: free and fixed earth support
4.2 Anchored bulk heads, design of anchored bulk heads
4.3 Arching in tunnels, open cut strutting and sheeting
4.4 Design and analysis of Sheet piles using PLAXIS/ GEO5

Unit-V: Retaining Wall
5.1 Rigid Retaining structures
5.2 Flexible Retaining structures
5.3 Braced Cuts
5.4 Analysis of retaining structures using using PLAXIS/ GEO5

Unit VI: Slopes and underground structures
6.1 Stability of finite and infinite slopes
6.2 Types of failures & different factors of safety
6.3 Determination of factor of safety by method of slices, Swedish circle, friction circle, Bishop's method, Morgenstern Price method, Taylor's stability number, location of critical circle
6.4 Stability analysis of earth dam slopes for different conditions
6.5 Underground Structures
6.6 Analysis of retaining structures and slope stability problems using PLAXIS/GEO5

Text/Reference Books:

1. S. Parkash and Gopal Ranjan, Analysis and Design of Foundation and Retaining Structures, Sarita Prakashan
2. B. M. Das, Advanced Soil Mechanics, McGraw Hills
3. Swami Saran, Soil Dynamics, I. K. International Publishing Pvt Ltd.
4. Alam Singh, Soil Mechanics, Asia Publishing House
5. K.R.Arora , Soil Mech & Foundation Engineering, Standard Publisher
6 .Dr. B.C.Punmia, Soil Mech & Foundation Engineering, Fireball Media

Software required / Web links:
http://nptel.ac.in/courses/105107120/
http://nptel.ac.in/courses/105101083/
GEO5
PLAXIS

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-703A)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-703A.1	3	3	3	1	2	-	-	-	-	-	-	2	3	1
BCE-DS-703A.2	2	2	3	1	2	-	-	-	-	-	-	2	3	1
BCE-DS-703A.3	3	2	3	1	2	2	2	3	2	2	1	2	1	1
BCE-DS-703A.4	3	2	3	1	2	-	-	-	-	-	-	2	3	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-721: MASONRY STRUCTURES

Credits 3		Max. Marks	: 200
L-T-P 3-0-0		Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Materials Testing & Evaluation (BCE-DS-404)
Course Type: Domain Specific Elective

Course outcomes: At the end of the course, students will be able to
BCE-DS-721.1. Correlate the masonry design approaches.
BCE-DS-721.2. Analyse Reinforced Masonry Members.
BCE-DS-721.3. Relate to interactions between members.
BCE-DS-721.4. Determine shear strength and ductility of Reinforced Masonry members.
BCE-DS-721.5. Check the stability of walls
BCE-DS-721.6. Perform Elastic and Inelastic analysis of masonry walls.

Unit 1 Introduction
1.1 Introduction, Historical Perspective
1.2 Masonry Materials
1.3 Masonry Design Approaches,
1.4 Overview of Load Conditions
1.5 Compression Behaviour of Masonry, Masonry Wall Configurations
1.6 Distribution of Lateral Forces

Unit 2 Flexural Analysis
2.1 Flexural Strength of Reinforced Masonry Members
2.2 In plane loading
2.3 Out-of-plane Loading

Unit 3 Masonry Structures
3.1 Interactions
3.2 Structural Wall
3.3 Columns and Pilasters
3.4 Retaining Wall
3.5 Pier and Foundation

PART-B

Unit 4 Shear Analysis
4.1 Shear Strength of Reinforced Masonry Members
4.2 Ductility of Reinforced Masonry Members.

Unit 5 Pre-stressed Masonry
5.1 Prestressed Masonry
5.2 Stability of Walls
5.3 Coupling of Masonry Walls
5.4 Openings
5.5 Columns

5.6 Beams.

Unit 6 Inelastic Analysis
6.1 Elastic and Inelastic Analysis
6.2 Modelling Techniques
6.3 Static Push Over Analysis
6.4 Use of Capacity Design Spectra

Text Books/ Reference Books:

1. NarendraTaly, Design of Reinforced Masonry Structures, 2nd Edition, ICC
2. Hamid Ahmad A and Drysdale Robert G, 1994, Masonry Structures: Behavior & Design
3. Maurizio Angelillo, 2014, Mechanics of Masonry Structures
4. Toma_evi_Miha, 1999, Earthquake-resistant Design of Masonry Buildings, Imperial College Press

Software required/Weblinks:
1. https://swayam.gov.in/nd1_noc19_ce21
2. https://nptel.ac.in/courses/105102088

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous Evaluation Table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-721)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BCE-DS-721.1.	3	1	-	-	-	2	-	-	-	-	-	2	1	1
BCE-DS-721.2.	3	-	2	2	-	2	-	-	-	-	-	2	2	2
BCE-DS-721.3.	3	-	-	-	-	1	-	-	-	-	-	2	3	3
BCE-DS-721.4.	1	-	-	-	-	-	-	-	-	-	-	2	2	2
BCE-DS-721.5.	2	1	2	2	2	-	2	3	2	2	1	2	1	1
BCE-DS-721.6.	3	-	-	-	-	-	2	2	2	1	1	1	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-722A: HIGHWAY CONSTRUCTION AND MANAGEMENT

Credits	3	Max. Marks	200
L-T-P	3-0-0	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Examination	100

Pre-requisites: Transportation Engineering (BCE-DS-406)
Course Type: Domain Specific Elective
Course Outcomes: At the end of this course, the students will be able to
BCE-DS-722A.1 Conduct surveys involved in highway planning and alignment
BCE-DS-722A.2 Characterize pavement materials
BCE-DS-722A.3 Comprehend various types of highway construction and their suitability under Indian conditions
BCE-DS-722A.4 Describe different aspects of highway maintenance
BCE-DS-722A.5 Apply fundamentals of planning and managementfor field highways.

PART A

Unit 1: Highway Development
1.1 Highway development and planning
1.2 Highway alignment and project preparation
1.3 Materials used in Highway Construction- Soils, Stone aggregates
1.4 Desirable properties, tests, requirements for different types of pavements

Unit 2: Highway Construction of flexible pavement
2.1 General features of highway construction
2.2 Embankment and subgrade
2.3 Construction of flexible pavement
2.4 Low volume roads

Unit 3: Highway Construction of rigid pavement
3.1 Necessity of providing a base course under cement concrete road
3.2 Selection of materials, construction methods,
3.3 Classification of various types of joints
3.4 Necessity of providing each type, method of construction of joints
3.5 Load transfer devices, dowel bars, tie bars

PART B

Unit 4: Geosynthetics in Pavements
4.1 Overview, introduction, types including natural geotextiles
4.2 Manufacturing methods, Functions of Geotextiles
4.3 Filtration, separation, protection, Sediment Control, Reinforcement
4.4 Application of various geotextile materials in Pavement

Unit 5: Highway Maintenance
5.1 Importance of highway maintenance works
5.2 Deterioration and damages in road infrastructure

5.3 Maintenance requirement in different road components
5.4 Distresses in flexible pavements and maintenance measures
5.5 Structural evaluation of flexible pavements

Unit 6: Highway Planning and Management
6.1 Need and nature of construction sector
6.2 Planning process, objectives, strategies and policies, making planning effective
6.3 Scope and functions of construction management
6.4 Use of project management software packages like Primavera, MS Project
6.5 Public–Private Partnerships and Private Sector Finance

Text/Reference Books:
1. S.K.Khanna, and Justo, 2017, Highway Engineering, 10th Edition, Nem Chand & Bros.
2. Partha Chakraborty, Principles of Transportation Engineering, PHI Learning
3. Sparkes, F.N. and Smith A.F. "Concrete Roads" Edwards Amola& Co., London.
4. R. Srinivasa Kumar, 2011, Textbook of Highway Engineering, Universities Press.
5. Paul H Wright and Karen K Dixon, 2009, Highway Engineering, 7th Edition, Wiley Student Edition.
6. Peurifoy R. L.,Construction, Planning, Equipment and Method, McGraw Hill Book Co.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
Course Articulation Matrix

CO Statement (BCE-DS-722A)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-722A.1	2	2		3	1	2	2	3		2	1	3	3	2
BCE-DS-722A.2	1		1			2	3	3					3	2
BCE-DS-722A.3	1	2		3	2		3		2	3	2	2	3	2
BCE-DS-722A.4	2	1	2		3		2	3		3		2	3	2
BCE-DS-722A.5	1	2	2		2	3	2		3		1	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-723: URBAN TRANSPORTATION PLANNING

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Transportation Engineering (BCE-DS-406)
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-723.1. Describe various aspects of urban morphology
BCE-DS-723.2. Explain the transport planning process and its features.
BCE-DS-723.3. Design the trip production and attraction models to find out the road users for a particular trip.
BCE-DS-723.4. Analyze the distribution of traffic flow of a particular trip and its routes
BCE-DS-723.5. Implement the various route assignment techniques for networking oftraffic.
BCE-DS-723.6. Develop action plan for urban transport problem and their evaluation process.

PART-A

Unit 1: Urban Morphology
1.1 Urbanization and travel demand
1.2 Urban activity systems and travel patterns
1.3 Systems approach
1.4 Trip based and Activity based approach

Unit 2: Urban Transportation Planning
2.1 Goals, Objectives and Constraints
2.2 Inventory, Model building,
2.3 Forecasting and Evaluation
2.4 Study area delineation
2.5 and UTP survey

Unit 3: Trip Generation
3.1 Trip classification
3.2 Productions and attractions
3.3 Trip rate analysis
3.4 Multiple regression models
3.5 Category analysis

Unit 4: Trip Distribution& Modal Split
4.1 Growth factor models
4.2 Gravity model
4.3 Opportunity model
4.4 Mode choice behavior
4.5 Trip end and trip interchange models
4.6 Probabilistic models, Utility functions, Logit models

Unit 5: Traffic Assignment

5.1 Transportation networks, Minimum Path Algorithms
5.2 Assignment methods – All or Nothing assignment
5.3 Capacity restrained assignment and Multi path assignment
5.4 Route-choice behavior

Unit 6: Land Use Transportation Models

6.1 Urban forms and structures,
6.2 Location models, Accessibility
6.3 Land use models - Lowry derivative models
6.4 Quick response techniques
6.5 Non-Transport solutions for transport problems
6.6 Preparation of alternative plans
6.7 Evaluation techniques
6.8 Plan implementation - Monitoring - Financing of Project

Text Books/ Reference Books

1. J.D.D Ortuzar and L.G. Willumsen, 1990, Modelling Transport, John Wiley & Sons.
2. M.E. Ben Akiva and S.R. Lerman, 1985, Discrete Choice Analysis: Theory and Application to Travel Demand, The MIT Press, Cambridge Massachusetts.
3. B.G.Hutchinson, 1974, Principles of Urban Transport Systems Planning, McGraw Hill Book Company.
4. L.R. Kadiyali, 2006, Traffic Engineering and Transport Planning, Khanna Publishers, New Delhi.

Software required/Weblinks:

https://nptel.ac.in/courses/124107007/23
https://nptel.ac.in/courses/105107067/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-723)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-723.1.	-	1	-	1	-	-	-	-	-	-	-	2	3	2
BCE-DS-723.2.	1	2	3	3	2	3	3	2	3	3	2	2	3	2
BCE-DS-723.3.	3	2	3	2	2	2	3	1	2	2	2	2	3	2
BCE-DS-723.4.	2	2	3	1	2	2	3	1	2	1	-	2	3	2
BCE-DS-723.5.	3	2	3	2	2	2	2	1	1	2	1	2	3	2
BCE-DS-723.6.	2	2	3	1	2	2	2	-	1	2	2	2	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-724: ENVIRONMENTAL LAWS & POLICY

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Environmental Engineering (BCE-DS-602)
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-724.1 Explain the concept of environment, nature and eco-system
BCE-DS-724.2 Infer from environmental laws and policies
BCE-DS-724.3 Relate to the concept of sustainable development
BCE-DS-724.4 Assess environment and conflicts management
BCE-DS-724.5 Compare national and international laws

PART-A

Unit 1: Introduction
1.1 Overview of environment, nature and eco system

Unit 2: Laws & Policies
2.1 Concept of laws and policies, Origin of environmental law, Introduction to environmental laws and policies

Unit 3: Infrastructure
3.1 Environment and Governance, sustainable development and environment understanding, Climate change, carbon crediting, carbon foot print etc.

PART-B

Unit 4: Laws
4.1 Introduction to trade and environment. International environmental laws

Unit 5: Built Environment
5.1 Right to Environment as Human Right International Humanitarian Law and Environment, environment and conflicts management

Unit 6: Practical Applications
6.1 Famous international protocols like Kyoto.

Text Books/ Reference Books:

1. Summet Malik, Environmental Law, Volume-II, Eastern Book Company
2. Matthew John Franchetttiand DefneApul, Carbon Footprint Analysis, Concepts, Methods, Implementation & Case Studies, CRC Press
3. Jacqueline Peel and Ruth Mackenzie, Principles of Environmental Law, Philippe Sands , 4th Edition, Cambridge University Press

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-724)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-724.1	-	1	-	-	-	-	-	-	-	-	-	-	-	-
BCE-DS-724.2	-	-	2	-	-	-	-	2	1	-	-	-	2	2
BCE-DS-724.3	1	-	-	-	-	-	2	-	-	3	2	2	-	-
BCE-DS-724.4	-	-	-	2	-	2	-	-	-	-	-	-	-	-
BCE-DS-724.5	-	-	-	-	2	-	-	-	-	-	2	-	-	-

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-725: PHYSICO-CHEMICAL PROCESSES FOR WATER AND WASTEWATER TREATMENT

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Environmental Engineering (BCE-DS-602)

Course Type: Domain Specific Elective

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

BCE-DS-725.1 Experiment with qualitative aspects of water treatment
BCE-DS-725.2 Decide appropriate water treatment techniques to be used
BCE-DS-725.3 Identify environmental problems and develop science-based solutions
BCE-DS-725.4 Analyzephysico-chemical and biological processes and their applications
BCE-DS-725.5 Design water treatment systems.

PART-A

Unit 1: Water Purification

1.1 Water purification in natural systems
1.2 Physical processes, chemical processes and biological processes
1.3 Primary, secondary and tertiary treatment
1.4 Unit operations, unit processes. Aeration and gas transfer, Sedimentation, different types of settling,
1.5 Sedimentation tank design

Unit 2: Coagulation

2.1 Coagulation and flocculation, coagulation processes
2.2 Stability of colloids, destabilization of colloids
2.3 Destabilization in water and wastewater treatment
2.4 Transport of colloidal particles
2.5 Design aspects

Unit 3: Filtration

3.1 Filtration processes
3.2 Hydraulics of flow through porous media
3.3 Rate control patterns and methods
3.4 Filter effluent quality parameters, mathematical model for deep granular filters
3.5 Slow sand filtration, rapid sand filtration, pre-coat-filtration, design aspects

PART-B

Unit 4: Disinfection

4.1 Disinfection: Types of disinfectants
4.2 Kinetics of disinfection, chlorination and its theory
4.3 Design of Chlorinators.
4.4 Precipitation
4.5 Hardness removal, Iron, Mn, and heavy metal removal;

Unit 5: Adsorption

5.1 Adsorption equilibria and adsorption isotherm

5.2 Rates of adsorption
5.3 Sorption kinetics in batch reactors, continuous reactors
5.4 Factors affecting adsorption.

Unit 6: Ion Exchange Processes
6.1 Ion Exchange-exchange processes
6.2 Materials and reactions, Methods of operation
6.3 Application, design aspects. Membrane Processes
6.4 Reverse osmosis,
6.5 Ultrafiltration
6.6 Electrodyalisis

Text Books/ Reference Books:

1. Gilbert Masters, Introduction to Environmental Engineering and Science, Prentice Hall, New Jersey.
2. P. AarneVesilind and Thompson, 2008, Introduction to Environmental Engineering, Second Edition.
3. H.S. Peavy and G.Tchobanoglous, 1985, Environmental Engineering, Mc-Graw -Hill International Editions, New York.
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.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-725)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-725.1	3								2	2				
BCE-DS-725.2		2		3	2	2	2	2		2	2			
BCE-DS-725.3					3	2		2	2					
BCE-DS-725.4										2	1			
BCE-DS-725.5			3					3	2		2	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-726: ENGINEERING RISK & UNCERTAINTY

Credits 3		Max. Marks	: 200
L-T-P 3-0-0		Continuous Evaluation	: 100
Examination Duration 3 hrs		End Semester Exam	: 100

Pre-requisites: None
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-726.1 Identify non deterministic Civil Engineering problems
BCE-DS-726.2 Apply design and decision making to identified problems
BCE-DS-726.3 Use stochastic methods
BCE-DS-726.4 Simulate model design
BCE-DS-726.5 Contrast the simulated models

PART-A

Unit 1: Non-Deterministic Problems
1.1 Identification non-deterministic problems in civil engineering
1.2 modeling of non-deterministic problems in civil engineering

Unit 2: Decision making
2.1 Design and decision making

Unit 3: Stochastic concepts
3.1 Development of stochastic concepts

PART-B

Unit 4: Real Design
4.1 Simulation models
4.2 Relevant real design

Unit 5: Simulation models
5.1 Simulation models
5.2 Relevance to Real Design

Unit 6: Decision Problems
6.1 Decision problems in various areas of civil engineering

Text/ Reference Books:

1. Mohammadand Mark P. Kaminskiy, Reliability Engineering and Risk Analysis, Taylor & Francis

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-726.1	3	3	2	1	2	-	-	-	-	-	-	2	3	2
BCE-DS-726.2	3	3	2	1	2	-	-	-	-	-	-	2	3	2
BCE-DS-726.3	3	3	2	1	2	-	-	-	-	-	-	2	3	2
BCE-DS-726.4	3	3	2	1	2	-	-	-	-	-	-	2	3	2
BCE-DS-726.5	1	1	1	1	1	2	2	3	2	2	1	2	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-728A: BRIDGE ENGINEERING

Credits	3	Max. Marks	200
L-T-P	2-0-2	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Examination	100

Pre-requisites: None
Course Type: Domain Specific Elective
Course Outcomes: The students will be able to

BCE-DS-728A.1. Relate to the basic concept of Bridge Engineering and IRC Loading as per IRC 6.
BCE-DS-728A.2. design piers and abutments
BCE-DS-728A.3. Apply seismic design and aerodynamic stability considerations
BCE-DS-728A.4. design and analyse the bridge components in AutoCAD and STAAD Pro.

PART-A

Unit 1: General

1.1 General; classification of bridges, site selection, geometric and hydraulic design consideration.
1.2 Planning the different parts of a particular bridge on AutoCAD 2D and 3D.

Unit 2: Loading standards

2.1 Loading standards for highway and railway bridges.
2.2 General design consideration; optimum spans.
2.3 Applying different types of Loads on the Bridge Pavement and analyze the same on STAAD Pro.

Unit 3: Culverts

3.1 Concrete bridges: Culverts; Slab, T-beam,
3.2 Box girder bridges, balanced cantilever bridge
3.3 Using of MS Excel for making the Designing Sheets of culverts and box – girder bridges.
3.4 Visualizing the effect of loading through SFD and BMD on STAAD Pro.

PART-B

Unit 4: Cable stayed bridge

4.1 Cable stayed bridge, extrados bridges; arch bridge.
4.2 Special requirements for Prestressed Concrete bridges.
4.3 Designing the different forms of Cable – Stayed Bridges on AutoCAD.

Unit 5: Steel bridges

5.1 Steel bridges: plate girder bridge, truss bridge.
5.2 Suspension cable bridge.
5.3 Analyzing the Steel Truss Bridge on STAAD Pro.

Unit 6: Substructures

6.1 Design of piers and abutments, pile and well foundations,
6.2 Bearings and expansion joints, special wearing coats;
6.3 Seismic design considerations

Text Books/ Reference Books:

1. Khanna and Justo, Bridge engineering
2. Krishna Raju, Bridge engineering

Software required/Web links:

https://nptel.ac.in/
https://swayam.gov.in/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-728A)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
BCE-DS-728A.1	1	3	3	3	2	1	2	2	-	-	1	2	1	2
BCE-DS-728A.2	3	3	3	-	3	-	-	-	-	-	-	2	3	2
BCE-DS-728A.3	1	1	1	1	2	3	2	3	3	3	3	2	2	3
BCE-DS-728A.4	1	2	3	1	1	2	1	2	-	-	1	2	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-729: Disaster Risk Reduction

PerioXX/week Credits	Max. Marks: 200
L: 3 T: 0 3	Internal/Continuous Evaluation: 100
Duration of Examination: 3 Hrs	External/ End Semester Examination: 100

Pre-requisites: None
Course Type: Program Elective
Course Outcomes: The students will be able to

BCE-DS-729.1 develop the basic conceptual understanding of disasters.
BCE-DS-729.2 determine the approaches of Disaster Management.
BCE-DS-729.3 build skills to respond to disaster
BCE-DS-729.4 acquire the disaster management techniques during pre and post – disaster scenarios.

PART A

Unit 1: Understanding the Concept of Disaster

1.1 Concepts of Disaster
1.2 Types of Disasters
1.3 Levels of Disasters
1.4 Concept of Risk and Vulnerability Assessment

Unit 2: Hazard Assessment

2.1 Frequency and Forewarning Levels of Disasters
2.2 Damage Potential of Disasters
2.3 Concept of Hazard Assessment
2.4 Dimensions of Vulnerability Factors

Unit 3: Disaster Management

3.1 Concept of Risk Management
3.2 Disaster Management Cycle
3.3 Response and Recovery Cycle
3.4 Mitigation and Preparedness

PART B

Unit 4: Capacity Building

4.1 Concept of Capacity Building
4.2 Components of Capacity Building
4.3 Resource Availability and Management
4.4 BIS Guidelines

Unit 5: Planning

5.1 Coping Strategies
5.2 Safety Plans and Norms
5.3 Disaster Management Planning
5.4 Disaster Management Act and Policy in India

Unit 6: Case Studies

6.1 Earthquake and its related disaster risk reduction techniques
6.2 Flood and its related disaster risk reduction techniques

6.3 Tsunami and its related disaster risk reduction techniques
6.4 Draught and its related disaster risk reduction techniques
6.5 Cyclones and its related disaster risk reduction techniques

Text Books/ Reference Books:

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
2. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
3. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
4. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.

Software required/Weblinks:
https://nptel.ac.in/courses/124/107/124107010/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-729)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-729.1	2		1			2	3	2					3	2
BCE-DS-729.2		1					2						2	3
BCE-DS-729.3					2					3	2		3	2
BCE-DS-729.4				2				3	2	3			3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-730: Advanced Design of Concrete Structures

Periods/week Credits	Max. Marks: 200
L: 2 P: 2 3	Internal/Continuous Evaluation: 100
Duration of Examination: 3 Hrs	External/ End Semester Examination: 100

Pre-requisites: Design of Concrete Structures – I
Course Type: Program Elective

Course Outcomes: The students will be able to

BCE-DS-730.1. Analyze different types of rigid frames for vertical and horizontal loads by approximate methods.

BCE-DS-730.2. Design Fixed and Continuous beams, Staircases, Retaining walls, Foundations and Water Tank

BCE-DS-730.3. Design different Civil Structures on STAAD PRO

BCE-DS-730.4. Measure the various losses in pre-stressed concrete beam

PART-A

Unit 1: Building frames

1.1 Introduction to different types of building frames
1.2 Types of loads acting on Buildings
1.3 Approximate method of analysis of rigid frame for vertical loads by Substitute Frame method
1.4 Approximate method of analysis of rigid frame for lateral loads by
  1.4.1 Portal Frame method
  1.4.2 Cantilever method
1.5 Analysis of a typical building frame structures using Staad Pro

Unit 2: Fixed and Continuous Beams

2.1 Review of concepts of design of R.C.C.
2.2 Concepts of redistribution of moments in Statically Indeterminate Structures
2.3 Design of Fixed beams using IS 456:2000, SP16 and reinforcement detailing as per SP34
2.4 Design of Continuous beams using IS 456:2000, SP16 and reinforcement detailing as per SP34
2.5 Design a continuous beam using Staad Pro

Unit 3: Staircases and Flat slabs

3.1 Types of staircase and their structural behaviour
3.2 Design of straight stair case
3.3 Design of Dog-Legged stair case
3.4 Types and components of Flat Slab
3.5 Design of Flat Slab
3.6 Draw reinforcement detailing in different types slabs in Auto cadd
3.7 Design a typical slab section in Staad Pro/ ETabs

PART-B

Unit 4: Foundations and Retaining Walls

4.1 Design of Raft Foundation

4.2 Design of Piles and Pile Cap
4.3 Introduction to various types of Retaining walls
4.4 Loads acting on various components of Cantilever and Counterfort Retaining walls
4.5 Design of Cantilever Retaining wall
4.6 Draw reinforcement details in retaining walls in Auto cadd
4.7 Design a Retaining wall using Staad Pro

Unit 5: Water tanks

5.1 General Design requirements of Water Tanks as per IS 3370:2009
5.2 Joints in Water Tanks
5.3 Design of Circular Tank resting on ground with Flexible and Rigid Base
5.4 Design of Rectangular Tank resting on ground with Flexible and Rigid Base
5.5 Draw reinforcement details of different types of water tank

5.6 Design a water tank using Stadd pro/ ETabs

Unit 6: Prestressed concrete

6.1 Basic Concepts
6.2 Classification and types of Prestressing
6.3 Prestressing Systems
6.4 Losses of Prestress
6.5 Properties of materials
6.6 Analysis of Beams for flexure
6.7 Moment of Resistance of Rectangular and T-Section for flexure as per IS:1343-2012

Text/Reference Books:

1 Punmia & Jain et al, R.C.C. Designs, Jain Book Agency.
2 Pillai & Menon, Reinforced Concrete Design, Tata McGraw Hill.
3 N. Subramanian, Design of Reinforced Concrete Structures, Oxford University Press
4 Sinha, Reinforced Concrete Design, S.N. Education, Laxmi Publications.
5 Krishna Raju N, Pre-Stressed Concrete, Tata McGraw Hill.
6 IS:456-2000, Indian Standard of Practice for Plan and Reinforced Concrete.
7 IS:1343-2012, IS Code of Practice for Pre-stressed Concrete
8 IS:3370-2009, Indian Standard Code of Practice for Liquid Retaining Structures.
9 SP 16, 1980: Design Aids for Reinforced Concrete to IS:456-1978SP 34, 1987:Handbook on Concrete Reinforcement and Detailing.

Software required / Web links
http://nptel.ac.in/courses/105105105/
http://nptelvideos.in/2012/11/design-of-reinforced-concrete-structures.html

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-730)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BCE-DS-730.1	3	3	2	-	2	1	-	2	3	1	1	2	2	2
BCE-DS-730.2	3	3	2	-	2	1	-	2	2	-	1	2	3	3
BCE-DS-730.3	3	3	2	-	2	1	-	2	2	-	1	2	3	3
BCE-DS-730.4	3	3	2	-	2	1	-	2	2	-	1	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH & STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-731: Metro Systems and Engineering

Periods/week	Credits	Max. Marks	: 200
L: 3 T:	3	Internal	: 100
Duration of Examination: 3 Hrs		External	: 100

Pre-requisite: None

Course Type: Discipline Elective

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

BCE-DS-731.1. Establish the requirements of metro for a city

BCE-DS-731.2. Describe the basic planning, routing and financing involved for a Metro Project

BCE-DS-731.3. Explain the various inter-disciplinary involvements required for a Metro Project

BCE-DS-731.4. Analyse the available construction technologies for Metro Projects

Part-A

Unit 1: Overview

1.1. Construction methods for: Elevated and underground Stations
1.2. Viaduct spans and bridges
1.3. Underground tunnels
1.4. Depots
1.5. Commercial and Service buildings

Unit 2: Initial Surveys & Investigations

2.1. Basics of Construction Planning & Management
2.2. Construction Quality & Safety Systems
2.3. Carbon credits and clear air mechanics

Unit 3: Traffic integration

3.1. Multimodal transfers and pedestrian facilities
3.2. Environmental andsocial safeguard
3.3. Track systems-permanent way
3.4. Facilities Management

Part-B

Unit 4: Electronics and Communication Engineering

4.1. Signaling systems
4.2. Automatic fare collection
4.3. Operation Control Centre
4.4. SCADA and other control systems
4.5. Platform Screen Doors

Unit 5: Mechanical Engineering

5.1. Rolling stock
5.2. Vehicle dynamics and structure

5.3. Tunnel Ventilation systems
5.4. Air conditioning for stations and buildings
5.5. Fire control systems; Lifts and Escalators

Unit 6: Electrical Engineering
6.1. OHE
6.2. Traction Power
6.3. Substations- TSS and ASS
6.4. Power SCADA
6.5. Standby and Back-up systems

Reference Books:
1. Satish Chandra, Railway Engineering
2. C Venkataramaiah, Transportation Engineering – II
3. Saxena, Railway Engineering

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
Course Articulation Matrix

CO Statement (BCE-DS-731)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-731.1	3	-	-	-	2	-	-	-	-	-	2	1	1	2
BCE-DS-731.2	3	-	-	-	2	2	-	-	2	-	-	2	1	3
BCE-DS-731.3	2	3	-	2	-	-	2	-	-	-	-	-	1	3
BCE-DS-731.4	-	-	-	-	-	-	-	2	-	3	-	-	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-732: Construction Safety

Periods/week Credits Max. Mark:200

L: 3 T: 0 3 Internal/Continuous Evaluation: 100

Duration of Examination: 3 Hrs External/ End Semester Examination : 100

Prerequisites: None

Course Type: Discipline Elective

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

BCE-DS-732.1. Relate to the concept of safety in construction.

BCE-DS-732.2. Comprehend safety in various construction operations.

BCE-DS-732.3. Apply National Building Code Provisions on construction safety

BCE-DS-732.4. Ensure safety while handling construction material and equipment.

BCE-DS-732.5. Develop management plans to prevent accidents during constructions.

PART-A

Unit 1: Basic Philosophy

1.1 Introduction to Construction Industry, safety issues in construction- Human factors in construction safety management.
1.2 Roles of various groups in ensuring safety in construction industry.
1.3 Accident and Hazards – their causes & effect, accident investigation and reporting. Monitoring of safety performance.
1.4 Treatment of injuries and rehabilitation. Safety Budget, Safety officers.

Unit 2: Safety in Various Construction Operation

2.1 Safety in various construction operations.

2.2 Excavation- under- water works- under-pinning & shoring

2.3 Tunneling, Blasting.

2.5 Indian Standards on construction safety- National Building Code Provisions on construction safety.

Unit 3: Safety in Demolition Operations

3.1 Planning & permit.
3.2 Precautions prior to demolition; protection of public.
3.3 Precautions during demolition; sequence of demolition operations from safety point.

PART-B

Unit 4: Safety in Material Handling

4.1 Safety in material handling and equipment.

4.2 Safety in storage & stacking of construction materials.

4.3 Safety in the use of construction equipment

Unit 5: Working at Heights

5.1 Fall protection in construction OSHA 3146 – OSHA requirement for working at heights

5.2 Safe access and egress – safe use of ladders.

5.3 Scaffoldings, requirement for safe work platforms, stairways, gangways and ramps –

5.4 Fall prevention and fall protection, safety belts, safety nets, fall arrestors, controlled access zones.

Unit 6: Contract Labour

6.1 Contract Labor (R&A) Act and Central Rules: Definitions, Registration of Establishments,

6.2 Licensing of Contractors, Welfare and Health provisions in the Act and the Rules, Penalties,

6.3 Framing contract conditions on safety, and related matters, relevance of ergonomics in construction safety.

6.4 Training of Building workers, General Safety, Health & Well fare provisions, Penalties.

6.5 Safety monitoring systems – working on fragile roofs, work permit systems, height pass – accident case studies

Text Books/ Reference Books:

1. R, Butter Worth's, 1985, Construction hazard and Safety Hand book' by Hudson.

2. V.J.Davies and K.Thomasin , 1990, Construction Safety Hand Book' by, Thomas Telford Ltd., London.
3. Charles D. Reese & James V. Edison, Handbook of OSHA Construction Safety and Health.
4. The National Building Code, BIS, (2017)
5. Jnathea D.Sime, 1988, Safety in the Build Environment
6. Gupta A K, Reliability Maintenance and Safety Engineering, Laxmi Publications, New Delhi.
7. John V. Grimoldi , Safety Management, AITBS Publishers and Distributors, New Delhi.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination
Course Articulation Matrix

CO Statement (BCE-DS-732)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-732.1	1	1	3	1	-	2	3	3	1	-	-	1	1	-
BCE-DS-732.2	-	1	2	-	1	2	-	3	3	-	-	2	1	-
BCE-DS-732.3	1	2	3	-	2	1	3	-	-	-	3	-	3	3
BCE-DS-732.4	-	-	-	3	3	-	-	-	-	2	3	-	2	3
BCE-DS-732.5	2	-	-	3	-	-	2	-	2	3	-	3	-s	2

SEMESTER-VIII

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

PROJ-CE-800A: SUMMER INTERNSHIP-IV

Credits 10		Max. Marks	: 300
Practical/Week 20 weeks		Continuous Evaluation	: 200
		End Semester Exam	: 100

Prerequisites: None
Course Type: Project Work

Course Outcomes: At the end of this course, the student will be able to:
PROJ-CE-800A.1. Acquire fundamental principles of Engineering.
PROJ-CE-800A.2. Have in depth understanding and technical competency in relevant field
PROJ-CE-800A.3. Explore the various possibilities of a career in this field
PROJ-CE-800A.4. Formulate solutions to Engineering problems
PROJ-CE-800A.5. Generate reports on the experiences and project carries out

Every student will have to undergo Industrial Training for atleat 20 weeks in the relevant field of Engineering in which he/she is enrolled for B.Tech programme in 8^{th} semester. Respective Head of Department will approve the Industry/Organization for training. During this course of time, he/she will be regularly monitored and evaluated. On the completion of training duration, he/she will have to submit the training report, deliver a seminar about the work/project undertaken during the training and will have to appear for viva. The evaluation of the industrial training shall be made as per following:

Continuous Evaluation during training:

1. Evaluation by the Supervisor in the Industry	:	75 marks
2. Evaluation by Faculty Mentor during training visit	:	50 marks
3. Internal seminar/ Presentation	:	75 marks
Total Internal Marks	:	**200**

External Evaluation after training:

1. Project Report	:	30 marks
2. Seminar/Presentation	:	20 marks
3. Viva	:	50 marks

Total External marks		**100**
Total Credits	**:**	**20**

The parameters for evaluation during the training for Supervisor shall be as under:

		Marks
a)	Work/Project undertaken	15
b)	Punctuality/Regularity	10
c)	Discipline/Overall Conduct/Relations with Seniors and others	10
d)	Eagerness to acquire technical knowledge	20
e)	Overall Proficiency achieved during training	10
f)	Any contribution to the organization	10

	Total	**75**

The parameters for evaluation by the faculty during training shall be as under:

a)	Maintenance of Training Diary and Regularity	10
b)	Relations with Seniors and others	10
c)	Overall Conduct	10
d)	Willingness to Work	10
e)	Proficiency achieved	10

	Total	**50**

ARTICULATION MATRIX

CO Statement (PROJ-CE-800A)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
PROJ-CE-800A.1	2	2	3	-	1	2	2	-	-	-	-	-	3	2
PROJ-CE-800A.2	2	1	-	-	-	1	1	-	-	2	2	-	2	3
PROJ-CE-800A.3	3	3	-	2	3	-	1	1	-	3	-	-	1	3
PROJ-CE-800A.4	3	2	2	2	1	2	-3	2	2	2	-	1	3	3
PROJ-CE-800A.5	2	2	2	2	1	1	3	2	1	3	2	2	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-821: AIRPORT PLANNING AND DESIGN

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Transportation Engineering (BCE-DS-406)
Course Type: Domain Specific Elective

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

BCE-DS-8211. Explain the different components of airport and aircrafts.
BCE-DS-821.2. Analyse the requirements of an airport layout with respect to codal provisions.
BCE-DS-821.3. Design the airport runway geometric and length.
BCE-DS-821.4. Describe various elements of Taxiways in airport
BCE-DS-821.5. Undertake aprons and pavement planning
BCE-DS-821.6. Plan airport terminals

PART-A

UNIT-I: Introduction

1.1 Classification of airports
1.2 Aircraft characteristics
1.3 Aircraft Controls, Airport Site and Size selection
1.4 Airport Obstructions

UNIT-II: Runway Orientation

2.1 Runway orientation
2.2 Wind rose diagram
2.3 Runway configurations

UNIT-III: Runway Geometric And Length

3.1 Runway geometric elements
3.2 Runway width, the transverse grade, the longitudinal grade, the rate of change longitudinal grade, sight distance requirements
3.3 Basic runway length
3.4 Corrections to basic runway length.

PART-B

UNIT-IV: Taxiways

4.1 Taxiway requirements- alignment geometry
4.2 Length and the width of the taxiway,
4.3 The transverse and the longitudinal grades, the sight distance and the design of the turning radius
4.4 Exit taxiway, the turnaround taxiway and taxi lane.

UNIT-V: Aprons and Parking

5.1 Types of aprons
5.2 Aprons- planning and design
5.3 Design principles of critical, semi-critical, non-critical airport pavements- FAA and PCA methods
5.4 Aircraft parking

UNIT-VI: Terminal Planning and Hangers

6.1 Airport terminal and amenities ; Airport lighting and marking
6.2 Airport landscaping, grading and drainage general
6.3 Air traffic control lighting and signing;
6.4 Airport safety; Environmental impact of airports;

References:

1. N.J. Ashford, P.H. Wright, 1992, Airport Engineering, 3rd Edition, John Wiley.
2. R.M. Horonjeff, F.X. Mc Kelvey, W.J Sproule, Seth Young, 2009, Planning and Design of Airports, Fifth Edition, TMH International Publishers.

Supplementary Reading:

1. Khanna, Arora and Jain,2001, Planning and Design of Airports, Nemchand Bros.
2. Wells, Alexander; Young, Seth, July 2009, Airport Planning & Management,,5thEdition,McGraw Hill
3. De N. Richard, &Odoni, 2004, Airport Systems: Planning, Design, and Management, 1st Edition, McGraw Hill Amedeo.
4. Traffic Flow Fundamentals, May 1989, Prentice Hall
5. F. L. Mannering, 2008, Principles of Highway Engineering and Traffic Analysis, 4th Edition, John Wiley.

Software required / Web links:

http://nptel.ac.in/courses/105107120/
http://nptel.ac.in/courses/105101083/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-821)	**PO 1**	**PO 2**	**PO 3**	**PO 5**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-821.1	2	2	2	1	2	1	1	-	1	-	-	2	2	1
BCE-DS-821.2	1	2	3	1	1	1	1	-	1	-	-	2	3	1
BCE-DS-821.3	2	2	2	2	2	1	2	-	1	-	-	2	3	1
BCE-DS-821.4	2	2	3	1	2	1	2	-	2	-	-	2	3	1
BCE-DS-821.5	2	2	3	1	2	2	2	3	2	2	1	2	1	1
BCE-DS-821.6	2	2	1	2	2	2	2	2	2	1	1	1	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-822: CONSTRUCTION EQUIPMENTS & AUTOMATION

Credits 3	Max. Marks : 200
L-T-P 3-0-0	Continuous Evaluation : 100
Examination Duration 3 hrs	End Semester Exam : 100

Pre-requisites: Construction Project Planning & Systems (BCE-DS-603)
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to
BCE-DS-822.1 Apply concept of construction automation
BCE-DS-822.2 Compare conventional methods to mechanized methods
BCE-DS-822.3 Describe the capabilities and applications of construction equipments in real life scenarios
BCE-DS-822.4 Emphasize the quality control using different concrete related equipment.
BCE-DS-822.5 Justify the role of drones and robots in construction on economic basis.

PART-A

Unit 1: Construction Equipment & Automation: Conventional
1.1 Conventional construction methods Vs Mechanized methods
1.2 Advantages and disadvantages of Mechanized methods.

Unit 2 Earthmoving Equipments
2.1 Earth movers
2.2 Dewatering equipments

Unit 3 Concrete related equipments
3.1 Mixing
3.2 transporting & placing

Unit 4 Plastering machines
4.1 Pre-stressing jacks
4.2 Grouting equipment

Unit 5 Cranes
5.1 Hoists and other equipment for lifting
5.2 Equipment for transportation of materials

Unit 6 Equipment Productivities
6.1 Use of Drones for spread out sites
6.2 Use of robots for repetitive activities

Text Books/ Reference Books:

1. R.L. Peurifoy, W.B. Ledbetter, and Schexnayder, 2005, Construction Planning Equipment and Methods, McGraw Hill. Singapore.
2. S.C. Sharma, 2008, Construction Equipment and Management, Khanna Publishers, Delhi.
3. S.V. Deodhar, 2008, Construction Equipment and Job Planning, Khanna Publishers Delhi.
4. Mahesh Varma, 2003, Construction Equipment and its planning and application, Metropolitan Book Company, New Delhi.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-822)	**PO1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-822.1	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-822.2	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-822.3	3	3	3	2	2	-	-	-	-	-	-	2	3	2
BCE-DS-822.4	3	3	3	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-822.5	3	3	3	3	3	-	-	-	-	-	-	2	3	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-823: AIR, NOISE POLLUTION AND CONTROL

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Environmental Engineering (BCE-DS-602)
Course Type: Domain Specific Elective

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

BCE-DS-823.1. Relate to the concept of ambient air quality
BCE-DS-823.2. Describe the long- term effects of air pollution on the planet- Global Climate Change, Ozone Holes
BCE-DS-823.3. Develop analytical, computational and research skills in this field
BCE-DS-823.4. Emphasize the particulate quality control using different related equipment
BCE-DS-823.5. Recognize different quality control principles for Gas contaminants
BCE-DS-823.6. Estimate the cost of air pollution control systems

UNIT 1: Introduction

1.1. Structure and composition of Atmosphere – Sources and classification of air pollutants
1.2. Ambient Air Quality and Emission Standards
1.3. Air Pollution Indices – Emission Inventories

Unit-2: Effects

2.1 Effects of air pollutants on human health, vegetation & animals, Materials & Structures
2.2 Effects of air Pollutants on the atmosphere, Soil & Water bodies
2.3 Long- term effects on the planet – Global Climate Change, Ozone Holes

Unit 3: Air Pollution Monitoring and Modelling

3.1 Ambient and Stack Sampling and Analysis of Particulate and Gaseous Pollutants
3.2 Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion
3.3 Wind profiles and stack plume patterns- Transport & Dispersion of Air Pollutants – Modeling Techniques
3.4 Air Pollution Climatology

Unit 4: Control of Particulate Contaminants

4.1 Factors affecting Selection of Control Equipment
4.2 Gas Particle Interaction, – Working principle, Design and performance equations of Gravity Separators, cyclones, Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations
4.3 Process Control and Monitoring – Costing of APC equipment
4.4 Case studies for stationary and mobile sources

Unit 5: Control of Gaseous Contaminants

5.1 Factors affecting Selection of Control Equipment – Working principle
5.2. Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters
5.3. Process control and Monitoring - Operational Considerations - Costing of APC Equipment

5.4. Case studies for stationary and mobile sources

Unit 6: Automobile and Noise Pollution:

6.1. Vehicular Pollution: Automobile emission- Types of emissions- Exhaust emissions, evaporative emissions, crank-case emissions

6.2. Prevention and control of vehicular pollution.

6.3. Noise Pollution: Sources and Effects of Noise Pollution

6.4. Measurement – Standards –Control and Preventive measures

6.5. Sources types and control of indoor air pollutants

6.6 Sick building syndrome types – Radon Pollution and its control

Text Books/ Reference Books:

1. Y. Anjaneyulu, Air Pollution & Control Technologies, 2002, Allied Publishers (P) Ltd.,India.
2. C.Stern Arthur,2006 Air Pollution, (Vol.I – Vol.VIII), Academic Press.
3. Daniel Vallero, 2008, Fundamentals of Air Pollution, Fourth Edition.
4. H.F. Liu David, B. G. Liptak, 2000, Air Pollution, Lweis Publishers.
5. K. Wang Lawrence, C. ParelraNorman, Yung Tse Hung,2004, Air Pollution Control Engineering, Tokyo.
6. Noel de Nevers, 1995, Air Pollution Control Engg, Mc Graw Hill, New York.
7. T. Davis Wayne, 2000, Air Pollution Engineering Manual, John Wiley & Sons, Inc.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-823)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-823.1	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-823.2	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-823.3	3	3	3	2	2	-	-	-	-	-	-	2	3	2
BCE-DS-823.4	3	3	3	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-823.5	3	3	3	3	3	-	-	-	-	-	-	2	3	2
BCE-DS-823.6	1	1	1	1	2	3	3	3	3	3	3	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-824A: ENVIRONMENTAL GEO-TECHNOLOGY

Periods/week	Credits	Max. Marks: 200
L: 2 T: 0 P:2	3	Internal/Continuous Assessment: 100
Duration of Examination: 3 Hrs		End Semester Exam: 100

Pre-requisites: -
Course Type: Discipline Elective Course
Course Outcomes: The student will be able to
BCE-DS-824A.1 Describe the concepts and principles of Geoenvironmental Engineering
BCE-DS-824A.2 Identify sources and types of wastes
BCE-DS-824A.3 Familiarize about landfill, clay liner design and Geosynthetics
BCE-DS-824A.4 Contrast various soil remediation and investigation methods

PART A

UNIT 1: Sources and Site Characterization
1.1 Scope of Geo-environmental Engineering,
1.2 Various Sources of Contaminations,
1.3 Need for contaminated site characterization
1.4 Role of soil in geoenvironmental applications

UNIT-2: Sources and classification of wastes
2.1 Classification of waste,
2.2 Characterization solid wastes,
2.3 Environmental Concerns with waste

UNIT-3: Soil- water Contamination Interaction
3.1 Soil mineralogy characterization and its significance in determining soil behavior
3.2 Soil-water interaction and concepts of double layer
3.3 Forces of interaction between soil particles.

PART B

UNIT-4: Landfills
4.1 Types of landfills and Site Selection,
4.2 Waste Containment liners
4.3 Leachate collection system, Cover system, Gas collection system.
4.4 Stability of landfills

UNIT-5: Remediation Techniques
5.1 Objectives of site remediation,
5.2 Selection and planning of remediation methods
5.3 Introduction to Bioremediation, Phytoremediation, electro-kinetic remediation, thermal remediation

Unit –6: Geosynthetics in Environmental Geotechnics:
6.1 Application of geo synthetics in solid waste management,
6.2 Rigid or flexible liners,
6.3 Bearing capacity of compacted fills,
6.4 Foundation for waste fill ground.

Text Books/ Reference Books:

1. Rowe, R. K., Geotechnical & Geoenvironmental Engineering Handbook, Kluwer Academic, 2001.

2. Reddi, L. N. and lnyang, H. I, Geoenvironmental Engineering Principles and Applications, Marcel. Dekker, Inc., New York , 2000.
3. Sharma H.D. and Reddy K.R.,Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies John Wiley & Sons, Inc., USA, 2004.
4. Bagchi,A.,Design of landfills and integrated solid waste management John Wiley & Sons, Inc., USA, 2004.

Software required / Web links:
https://nptel.ac.in/noc/courses/noc17/SEM2/noc17-ce27/
http://www.digimat.in/nptel/courses/video/105102160/L34.html

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-824A)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-824A.1	3	3	3	2	2	2	2	2	2	3	-	-	3	2
BCE-DS-824A.2	3	3	3	3	3	2	2	2	3	3	-	-	3	3
BCE-DS-824A.3	3	3	3	2	3	2	-	2	3	3	-	1	3	2
BCE-DS-824A.4	3	3	3	2	3	2	2	-	2	2	2	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-825A: INTELLIGENT TRANSPORTATION SYSTEM

Credits	3	Max. Marks	200
Lectures 2	Practical 2	Internal/Continuous Evaluation	100
Examination Duration	3 hrs	External/End Semester Exams	100

Course Type: Domain Specific

Course outcomes: At the end of the course, students will be able to
BCE-DS-825A.1. Comprehend the latest techniques of transportation systems.
BCE-DS-825A.2. Implement the various data collection techniques to determine the real-problem of the transport system.
BCE-DS-825A.3. Identify the importance of telecommunication in ITS systems.
BCE-DS-825A.4. Recommend needs and uses of ITS in various functional areas of ITS**.**

PART-A

Unit-1: Introduction

1.1 Introduction to Intelligent Transportation Systems (ITS)
1.2 Definition of ITS and Identification of ITS Objectives
1.3 Historical Background, Benefits of ITS.

Unit-2:Data Collection

2.1 ITS Data collection techniques
2.2 Detectors, Automatic Vehicle Location (AVL)
2.3 Automatic Vehicle Identification (AVI)
2.4 Geographic Information Systems (GIS)
2.5 Video data collection.

Unit-3: Telecommunication

3.1 Telecommunications in ITS
3.2 Importance of telecommunications in the ITS system
3.3 Information Management, Traffic Management Centres (TMC)
3.4 Vehicle, Road side communication
3.5 Vehicle Positioning System

PART-B

Unit-4: Advanced Management System

4.1 Advanced Traffic Management Systems (ATMS)
4.2 Advanced Traveller Information Systems (ATIS), Commercial Vehicle Operations (CVO)
4.3 Advanced Vehicle Control Systems (AVCS)
4.4 Advanced Public Transportation Systems (APTS

4.5 Advanced Rural Transportation Systems (ARTS)

Unit-5: ITS Needs and Services

5.1 ITS User Needs and Services
5.2 Travel and Traffic management
5.3 Public Transportation Management, Electronic Payment
5.4 Commercial Vehicle Operations, Emergency Management
5.5 Advanced Vehicle safety systems, Information Management

Unit-6: ITS Applications

6.1 Application of GIS in ITS, GIS Data Models, Projections and Coordinate Systems
6.2 Spatial Database Structure
6.3 Sources of Spatial Database
6.4 Use of GIS in analysis of real time traffic situation, automatic Vehicle Location
6.5 Hands out Assignment on GIS application

Text Books/ Reference Books:

1. ITS Hand Book 2000: Recommendations for World Road Association (PIARC)byKan Paul Chen, John Miles.
2. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.
3. National ITS Architecture Documentation, US Department of Transportation, 2007 CD- ROM).
4. Chowdhury, M. A., and Sadek, A., Fundamentals of Intelligent Transportation Systems Planning, Artech House, 2003
5. Turban, E., and Aronson, J. E., Decision Support Systems and Intelligent Systems, 5th Edition, Prentice Hall, 2004

Software required/Weblinks:

1. https://nptel.ac.in/content/storage2/courses/105101008/downloads/cete_48.pdf
2. Arc GIS
3. Machine Learning
4. MAT LAB

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-825A)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BCE-DS-825A.1	3	3	2	2	2	3	3	-	3	-	1	1	2	3
BCE-DS-825A.2	3	3	3	2	2	1	3	2	-	-	-	-	3	2
BCE-DS-825A.3	3	3	3	2	2	3	2	3	2	2	3	3	-	2
BCE-DS-825A.4	3	3	3	1	3	1	2	-	-	-	-	2	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-826 PORT AND HARBOUR ENGINEERING

Credits 3		Max. Marks	: 200
L-T-P 3-0-0		Continuous Evaluation	: 100
Examination Duration 3 hrs		End Semester Exam	: 100

Pre-requisites: None
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-826.1 Illustrate the concept of construction and planning of Harbors.
BEC-OS-806.2 Summarize the design parameters of ports and harbors.
BCE-DS-826.3 Enlist various components of the ports.
BCE-DS-826.4 Identify the facilities and requirements of Ports.
BCE-DS-826.5 Classify the requirements for dry and wet docks.
BCE-DS-826.6 Relate to the concept of waterways.

PART-A

Unit 1: Harbor Planning
1.1 Types of water transportation
1.2 Water transportation in India
1.3 Requirements of ports and harbors
1.4 Classification of harbors
1.5 Selection of site and planning of harbors
1.6 Location of harbor

Unit 2: Traffic estimation
2.1 Master plan,
2.2 Ship characteristics,
2.3 Harbor design,
2.4 Turning basin,
2.5 Harbor entrances,

Unit 3: Type of docks
3.1 location and number,
3.2 Site investigations – hydrographic survey, topographic survey, soil investigations
3.3 Current observations, tidal observations
3.4 Docks and Repair Facilities
3.5 Construction of breakwaters, berthing structures - jetties, fenders, piers, wharves, dolphins, trestle, moles
3.6 Harbour docks, use of wet docks, design of wet docks, repair docks, lift docks, dry docks, keel and bilge blocking

Unit 5 construction of dry docks,
5.1 Gates for dry docks, pumping plant,
5.2 Floating docks, slipways, locks, size of lock,

5.3 Lock gates, types of gates;

Unit 6 Navigational Aids: Requirements of signals,

6.1 Fixed navigation structures, necessity of navigational aids, light houses, beacon lights, floating navigational aids, light ships, buoys, radar;

6.1 Dredging and Coastal Protection: Classification, types of dredgers, choice of dredger, uses of dredged materials, coastal erosion and protection,

6.3 Sea wall, revetment, bulkhead, coastal zone and beach profile;

6.4 Port facilities: Port development, port planning, port building facilities, transit sheds, warehouses, cargo handling facilities,

6.1 Container handling terminal facilities, shipping terminals, inland port facilities. Inland waterways, Inland water transportation in India,

6.2 Classification of waterways, economics of inland waterways transportation, national waterways.

Text Books/ Reference Books:

1. Bindra, Docks and Harbour Engineering
2. R. Srinivasan, Harbour Dock and Tunnel Engineering.

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-OS-826)	**PO1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-826.1	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-826.2	3	3	3	2	2	-	-	-	-	-	-	2	3	2
BCE-DS-826.3	3	3	3	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-826.4	3	3	3	3	3	-	-	-	-	-	-	2	3	2
BCE-DS-826.5	1	1	1	1	2	3	3	3	3	3	3	2	2	3
BCE-DS-826.6	2	3	1	1	2	2	2	2	3	3	1	1	2	2

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-827 CONSTRUCTION PRODUCTIVITY

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: None
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to
BCE-DS-827.1. Relate the impacts of productivity with typical bench marks
BCE-DS-827.2. Develop daily progress report
BCE-DS-827.3. Utilize various productivity measurement techniques
BCE-DS-827.4. Explain productivity improvement measures
BCE-DS-827.5. Use of specialist software such as Vico for productivity studies

PART-A

Unit 1: INTRODUCTION
1.1 Definition of Productivity
1.2 Impact of productivities on construction duration and costs

Unit 2: CONSTRUCTION EQUIPMENTS
2.1 Measuring productivities of construction equipment
2.2 Staff and Labour and typical benchmarks for the same

Unit 3: PRODUCTIVITY ANALYSIS-1
3.1 Productivity analysis from Daily Progress Reports
3.2 Lean Construction concepts of Value Adding activities
3.3 Non-Value Adding Activities and Non-Value Adding but Necessary Activities

PART-B

Unit 4: PRODUCTIVITY ANALYSIS-1I
4.1 Productivity measurements
4.2 Special Lean Construction-oriented field methods such as Work Sampling
4.3 Takt time analysis

Unit 5: SURVEYS
5.1 Foreman Delay Surveys
5.2 Productivity improvement measures such as Value Stream Mapping
5.3 Location-Based management Systems,
5.4 Good Housekeeping, etc.

Unit 6: SOFTWARES
6.1 Use of specialist software such as Vico for productivity studies

Text Books/ Reference Books:

1. James J. Adrian, Construction Productivity: Measurement and Improvement
2. Eddy M Rojas, Construction Productivity (English)
3. K. K. Chitkara, Construction Project Management: Planning, Scheduling and Controlling 3rd Edition, Tata McGraw-Hill Education India

Software required/Weblinks:

https://nptel.ac.in/courses/105103093/21
https://nptel.ac.in/course.html
https://nptel.ac.in/courses/105106149/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS 827)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-827.1	3	1	3	3	2	3	2	-	-	3	2	-	2	3
BCE-DS-827.2	3	3	3	3	3	3	3	-	-	-	2	2	2	3
BCE-DS-827.3	3	2	3	3	2	3	3	-	-	3	1	-	3	2
BCE-DS-827.4	3	3	3	3	3	3	3	-	-	-	3	2	1	3
BCE-DS-827.5	3	-	2	-	-	2	-	-	-	-	-	-	1	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-828: SUSTAINABLE CONSTRUCTION METHODS

Credits 3		Max. Marks	: 200
L-T-P 3-0-0		Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: None
Course Type: Domain Specific Elective

Course Outcomes; At the end of this course, the student will be able to
BCE-DS-828.1. Apply the basics of foundations construction
BCE-DS-828.2. Describe the various types of formwork in conventional vs modular construction
BCE-DS-828.3. Utilize precast concrete construction methods.
BCE-DS-828.4. Evaluate potential to reduce the negative environmental impacts of construction activity.
BCE-DS-828.5. Examine the current LEED rating system for new construction
BCE-DS-828.6. Analyze case studies of green construction projects

PART-A

Unit 1: Foundations
1.1 Types of foundations and construction methods;

Unit 2: Formwork
2.1 Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs;
2.2 conventional framed structure with blockwork walls);
2.3 Modular construction methods for repetitive works;

Unit 3: Precast concrete
3.1 Precast concrete construction methods;
3.2 Basics of Slip forming for tall structures;
3.3 Basic construction methods for steel structures;
3.4 Basics of construction methods for Bridges;
3.5 Identification of cutting-edge sustainable construction materials, technologies, and

PART-B

Unit 4: Project management
4.1 project management strategies for use in the construction industry and
4.2 evaluation of their potential to reduce the negative environmental impacts of construction activity.

Unit 5: New Construction rating
5.1 Examination of the current LEED for New Construction rating system,
5.2 case study analysis of highly successful recent "green construction projects" through student team assignments and presentations.

Unit 6: LEED
6.1 Preparation for the LEED Green Associate professional licensing exam

Text Books/ Reference Books:

1. W. T. Segui, LRFD Steel Design, 2nd Ed., PWS Publishing, Boston.
2. C.G. Salmon and J.E. Johnson, Steel Structures: Design and Behavior, 1990 3rd Edition, Harper & Row, Publishers, New York.
3. Khanna and Justo, Bridge Engineering.
4. Krishna Raju, Bridge engineering.

Software required/Weblinks:

https://nptel.ac.in/
https://swayam.gov.in/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-828)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
BCE-DS-828.1	3	-	2	3	-	-	2	2	-	-	1	2	1	2
BCE-DS-828.2	-	2	-	3	2	-	3	1	3	-	1	2	3	2
BCE-DS-828.3	3	-	-	2	1	2	3	3	2	1	-	3	3	2
BCE-DS-828.4	-	2	3	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-828.5	3	-	3	3	3	-	-	-	-	-	-	2	3	2
BCE-DS-828.6	1	1	1	1	2	3	2	3	3	3	3	2	2	3

BCE-DS-829: SOLID AND HAZARDOUS WASTE MANAGEMENT

Credits 3	Max. Marks : 200
L-T-P 3-0-0	Continuous Evaluation : 100
Examination Duration 3 hrs	End Semester Exam : 100

Pre-requisites: Environmental Engineering (BCE-DS-602)
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to
BCE-DS-829.1. Relate to codal provisions of solid and hazardous waste management.
BCE-DS-829.2. Differentiate between hazardous and radioactive waste.
BCE-DS-829.3. Develop possible biological treatment of hazardous waste materials.
BCE-DS-829.4. Estimate Environmental risk due to solid waste
BCE-DS-829.5. Analyze different methods of Physicochemical Treatment of Solid and Hazardous Waste
BCE-DS-829.6. Conduct environmental audit, pollution prevention and facility development

PART-A

Unit 1: Municipal Solid Waste Management – Fundamentals
1.1 Municipal solid waste (management and handling) rules
1.2 Hazardous waste (management and handling) rules
1.3 Biomedical waste handling rules;
1.4 Flyashrules;recycled plastics usage rules; batteries (management and handling) rules, Sources; composition; generation rates;
1.5 Collection of waste; separation, transfer and transport of waste;
1.6 Treatment and disposal options

Unit 2: Hazardous Waste Management – Fundamentals
2.1 Characterization of waste; compatibility and flammability of chemicals
2.2 Fate and transport of chemicals; health effects
2.3 Radioactive Waste Management – Sources, measures and health effects
2.4 Nuclear power plants and fuel production; waste generation from nuclear power plants; disposal options

Unit 3: Environmental Risk Assessment
3.1 Defining risk and environmental risk
3.2 Methods of risk assessment; case studies
3.3 Landfill design, Landfill design for solid and hazardous wastes
3.4 Leachate collection and removal; landfill covers; incineration

PART-B

Unit 4: Physicochemical Treatment of Solid and Hazardous Waste
4.1 Chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes);
4.2 Physicochemical processes for hazardous wastes (soil vapour extraction, air stripping, chemical oxidation);
4.3 Ground water contamination and remediation

Unit 5: Biological Treatment of Solid and Hazardous Waste

5.1 Composting; bioreactors; anaerobic decomposition of solid waste

5.2 principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation

Unit 6: Regulations

6.1 Current management practices,

6.2 Environmental audit, pollution prevention, facility development and operation, site remediation: quantitative risk assessment, site and subsurface

6.3 Characterization, containment, remedial alternatives.

Text Books/ Reference Books:

1. John Pichtel, Waste Management Practices 2005, Taylor and Francis Group.
2. M.D. LaGrega, P.L. Buckingham, and Evans, J.C. 1994, Hazardous Waste Management, McGraw Hill International Editions, New York.
3. R.J. Watts, Hazardous Wastes - Sources, Pathways, Receptors John Wiley and Sons, New York.

Software required/Weblinks:

http://www.iswa.org.

http://enfor.nic.in.

https://nptel.ac.in/syllabus/syllabus_pdf/105106056.pdf

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials

Sessional tests

Surprise questions during lectures/Class Performance

Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-829)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-829.1	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-829.2	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-829.3	3	3	3	2	2	-	-	-	-	-	-	2	3	2
BCE-DS-829.4	3	3	3	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-829.5	3	3	3	3	3	-	-	-	-	-	-	2	3	2
BCE-DS-829.6	1	1	1	1	2	3	3	3	3	3	3	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-830: PRESTRESSED CONCRETE

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: None
Course Type: Domain Specific Elective

Course Outcomes

At the end of this course, the student will be able to

BCE-DS-830.1 Describe evolution of process of prestressing in comparison to RCC.
BCE-DS-830.2 Explain the basic aspects of prestressed concrete fundamentals, including pre and post-tensioning processes.
BCE-DS-830.3 Find out losses in the prestressed concrete
BCE-DS-830.4 Analyse prestressed concrete axial, flexure members for Flexure.
BCE-DS-830.5 Design prestressed concrete Type 1 deck slab ,beam/ girders satisfying the serviceability and strength provisions of the Indian Standards (IS: 1343-2012).
BCE-DS-830.6 Develop skills to utilize the relevant software in the analysis and design of prestressed concrete members.

PART-A

Unit-1: Introduction

1.1 Basic Concepts of Prestressing
1.2 Terminology
1.3 Advantages of Prestressed Concrete
1.4 Applications of Prestressed Concrete
1.5 Materials for Prestressed Concrete-High Strength Concrete, High Tensile Steel

Unit-2: Prestressing Systems

2.1 Tensioning Devices
2.2 Pre-tensioning Systems
2.3 Post-tensioning Systems

Unit-3: Losses of Prestress

3.1 Nature of losses of Prestress
3.2 Loss due to Elastic Deformation of Concrete
3.3 Loss due to Shrinkage of Concrete
3.4 Loss due to Creep of Concrete
3.5 Loss due to Relaxation of stress in steel
3.6 Total losses allowed for in Design

PART-B

Unit-4: Analysis of Members

4.1 Analysis of members under axial tension
    4.1.1. Analysis at transfer
    4.1.2. Analysis at service loads
    4.1.3. Analysis at ultimate loads
4.2 Analysis of members under flexure at service loads
    4.2.1. Based on stress concept

4.2.2. Based on force concept
4.2.3. Based on load balancing concept

Unit-5: Analysis of members under flexure

5.1 Cracking moment
5.2 Kern points
5.3 Pressure line
5.4 Analysis for ultimate strength
5.4.1. Variation of stress in steel
5.4.2. Condition at ultimate limit state

Unit-6: Design of prestressed members

6.1 Design of members under axial tension
6.2 Design of members for flexure
6.2.1. Preliminary design
6.2.2. Final design for type I members

Text Books: `

1. N.Krishna Raju, Prestressed Concrete, Tata-McGraw Hill, Delhi.
2. P. Dayaratram, Prestressed Concrete structures, Oxford & IBH Co., Delhi.
3. Jain & Jai Krishna, Plain & Reinforced Concrete, Vol- II, Nem Chand & Co., Roorkee.
4. IS 1343-1980 Code of Practice for Prestressed Concrete, Bureau of Indian standards, New Delhi.
5. IS 456-2000 Code of Practice for Plain and Reinforced, Bureau of Indian standards, New Delhi.

Software required / Web links:

http://nptel.ac.in/courses/105106117/
http://nptel.ac.in/courses/105106118/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each PART-A and PART-B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-830)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-830.1	3	2	2	2	1	1	-	1	1	2	2	3	3	3
BCE-DS-830.2	3	1	1	2	-	2	3	1	1	-	2	1	3	3
BCE-DS-830.3	2	2	2	2	-	-	-	-	-	-	2	2	3	3
BCE-DS-830.4	1	3	3	3	2	-	-	1	1	-	2	2	3	3
BCE-DS-830.5	1	1	1	1	1	3	3	2	1	1	1	1	3	3
BCE-DS-830.6	2	2	2	2	3	2	-	-	1	-	3	3	3	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-831A: REPAIRS & REHABILITATION OF STRUCTURES

Credits	3	Max. Marks	200
L-T-P	2-0-2	Continuous Evaluation	100
Examination Duration	3 hrs	End Semester Examination	100

Pre-requisites: Concrete Technology (BCE-DS-505)
Course Type: Domain Specific Elective
Course Outcomes: The students will be able to
BCE-DS-831A.1. Describe maintenance and Repair Strategies, Repair and Rehabilitation
BCE-DS-831A.2. Evaluate damaged structures according to inspection and assessment procedures
BCE-DS-831A.3. Relate to the concept of special Concretes and usage of concreting in repair work
BCE-DS-831A.4. Perform the advanced experiments related to Special Concrete and NDTs.

PART-A

Unit 1: Introduction
1.1 Maintenance and Repair Strategies, Repair and Rehabilitation, Importance of Maintenance
1.2 Various aspects of Inspection, Assessment procedure for evaluating a damaged structure
1.3 Strength and Durability of Concrete- Quality assurance for concrete –Strength
1.4 Performing the NDT on existing Structures such as Visual Inspection, Rebound Hammer Test.

Unit 2: Durability and Thermal properties
2.1 Durability and Thermal properties, of concrete – Cracks, different types,
2.2 Causes – Effects due to climate, temperature, Sustained elevated temperature,
2.3 Corrosion and Special Concretes- Polymer concrete, Sulphur infiltrated concrete.

Unit 3: Fibre reinforced concrete
3.1 Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete
3.2 Self-compacting concrete, Geopolymer concrete,
3.3 Reactive powder concrete, Concrete made with industrial wastes
3.4 Performing Strength and Workability Experiments in laboratory for Fibre – Reinforced Concrete
3.5 Performing Strength and Workability Experiments in laboratory for Sustainable Concrete

PART-B

Unit 4: Repair and Protection Methods
4.1 Techniques for Repair and Protection Methods- Non-destructive
4.2 Testing Techniques, Epoxy injection, Shoring, Underpinning,
4.3 Corrosion protection techniques – Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection
4.4 Performing experiments related to Cathodic Protection in Laboratory

Unit 5: Repair, Rehabilitation and Retrofitting
5.1 Repair, Rehabilitation and Retrofitting of Structures- Evaluation of root causes
5.2 Underpinning & shoring; some simple systems of rehabilitation of structures
5.3 Analyzing the existing structures on STAAD Pro/ ETABS for vulnerability assessment and providing best solution for retrofitting techniques.

Unit 6: Guniting, shotcreting
6.1 Guniting, shotcreting; Non-Destructive testing systems; Use of external plates,
6.2 carbon fibre wrapping and carbon composites in repairs – Perform experiments
6.3 Strengthening of Structural elements, Repair of structures distressed due to corrosion
6.4 NBC Guidelines regarding Fire, Leakage and Seismic Activities

Text Books/ Reference Books:

1. Poonam I Modi and Chirag N. Patel, Reappear and Rehabilitation of Concrete Structures.f
2. Varghese, Maintenance, Repair & Rehabilitation & Minor Works of Buildings.

Software required/Weblinks:
https://nptel.ac.in/
https://swayam.gov.in/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-831A)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
BCE-DS-831A.1	3	2	-	3	2	1	-	2	-	2	1	2	1	2
BCE-DS-831A.2	1	2	1	3	2	3	3	1	3	-	1	2	3	2
BCE-DS-831A.3	-	-	-	2	2	2	3	3	2	-	-	2	2	2
BCE-DS-831A.4	3	2	3	2	2	1	-	-	-	-	-	2	3	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-832: ENVIRONMENTAL IMPACT ASSESSMENT AND LIFE CYCLE ANALYSES

Credits	3	Max. Marks	: 200
L-T-P	3-0-0	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Environmental Engineering (BCE-DS-602)
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-832.1. Describe environmental impact assessment (EIA) as an environmental management tool.
BCE-DS-832.2. Trace the evolution of EIA.
BCE-DS-832.3. Discuss what forecasting of environmental changes entails.
BCE-DS-832.4. Explain strategic environmental assessment (SEA).
BCE-DS-832.5. List and comply with the environmental clearance procedures in India.
BCE-DS-832.6. Plan an environmental impact assessment study.

PART-A

Unit 1: Broad components of EIA

1.1 Introduction, definitions and concepts, rationale and historical development of EIA,
1.2 EIA for civil engineers, Initial environmental examination, environmental impact statement, environmental appraisal,
1.3 environmental impact factors and areas of consideration. Pertinent institutional information, unique pollution problems, existing visual quality, public participation techniques.
1.4 Composite consideration, potential cultural resources, potential visual impacts, geographical study area.

Unit 2: Methodologies:

2.1 Measurement of environmental impact, organization, scope and methodologies of EIA pertinent environmental factors.
2.2 Six generic steps, descriptive checklists, simple interaction matrix, stepped matrix, uniqueness ratio, habitat evaluation system. Public involvement techniques, comprehensive environmental impact study,
2.3 Various project types, archaeological properties, leachate testing, evaluation species, proposing agency,
2.4 EIA Models.

Unit 3: Status of EIA in India & Environmental management:

3.1 EIA Regulations in India,
3.2 Case studies from hydropower projects, hazardous industries and mining, Principles, problems and strategies;
3.3 Review of political, ecological and remedial actions.
3.4 Future strategies; multidisciplinary environmental strategies, the human, planning, decision-making and management dimensions.

PART-B

Unit 4: Environmental Audit:

4.1 Definitions and concepts, partial audit, compliance audit, methodologies and regulations, Introduction to ISO and ISO 14000.

4.2 EMAS regulations, Wider application of system-based approach.

Unit 5: EMS and Standardization

5.1 Local infrastructure development and environmental management: A system approach,

5.2 Regional environmental management system, Conversion plan development and implementation strategies

5.3 Environmental management systems in local government.

Unit 6: LCA and Carbon trading:

6.1 Life cycle assessment

6.2 Triple bottom line approach; Industrial Ecology. Ecological foot printing,

6.3 Design for Environment, Future role of LCA, Product stewardship, design, durability and justifiability, measurement techniques and reporting, Energy foot printing,

6.4 Food foot printing and Carbon foot printing. GHG emissions, global warming, climate change and Carbon credits, CDM,

6.5 Initiatives in India; Sustainable development; Future scenarios

Text Books/ Reference Books:

1. L. W. Canter,1997, Environmental Impact Assessment, 2nd Ed., McGraw-Hill.
2. P. Judith and G. Eduljee, 1994, Environmental Impact Assessment for Waste Treatment and Disposal Facilities, John Wiley & Sons.
3. G. Burke, B. R. Singh and L. Theodore, 2000, Handbook of Environmental Management and Technology, 2nd Ed., John Wiley &Sons.
4. C. H. Eccleston, Environment Impact Statements, 2000, A Comprehensive Guide to Project and Strategic Planning, John Wiley & Sons.
5. R. Welford, 1996, Corporate Environmental Management - Systems and Strategies, Universities Press.
6. K. Whitelaw and Butterworth, 1997, ISO 14001: Environmental System Handbook.
7. The Economist Intelligence Unit, Best Practices - Environment, 1993,Universities Press.
8. R. Therivel, John Glasson, Andrew Chadwick, 2005, Introduction to Environmental Impact Assessment (Natural and Built Environment), Routledge.

Software required/Weblinks:

https://nptel.ac.in/courses/120108004/module3/lecture3.pdf
https://nptel.ac.in/syllabus/syllabus_pdf/105103024.pdf

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-832)	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O 1	P S O 2
BCE-DS-832.1	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-832.2	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-832.3	3	3	3	2	2	-	-	-	-	-	-	2	3	2
BCE-DS-832.4	3	3	3	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-832.5	3	3	3	3	3	-	-	-	-	-	-	2	3	2
BCE-DS-832.6	1	1	1	1	2	3	3	3	3	3	3	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-833: EARTHQUAKE ENGINEERING

L-T-P Credits 3		Max. Marks	: 200
3-0-0		Continuous Evaluation	: 100
Examination Duration 3 hrs		End Semester Exam	: 100

Pre-requisites: Engineering Mechanics for Civil Engineers (BCE-DS-302)
Course Type: Domain Specific Elective

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

BCE-DS-833.1	Distinguish the different types of dynamic loads, mathematical modelling, degree of freedom and mode shapes.
BCE-DS-833.2	Apply the concept of Multi Degree of Freedom System
BCE-DS-833.3	Relate to the elements of seismology
BCE-DS-833.4	Design ductile detailing of linear structural elements as per IS 13920:1993.
BCE-DS-833.5	Choose the codal provisions to real life problems as per IS 1893:2002.
BCE-DS-833.6	Compute response of Structures to Earthquake

PART-A

UNIT 1: Theory of Vibrations

1.1 Theory of Vibrations; Concept of inertia and damping - Types of Damping
1.2 Difference between static forces and dynamic excitation - Degrees of freedom –
1.3 SDOF idealization - Equations of motion of SDOF system for mass as well as base excitation
1.4 Free vibration of SDOF system - Response to harmonic excitation
1.5 Impulse and response to unit impulse
1.6 Duhamel integral

UNIT 2: Multiple Degree of Freedom System

2.1 Multiple Degree of Freedom System; Two degree of freedom system
2.2 Normal modes of vibration - Natural frequencies - Mode shapes –
2.3 Introduction to MDOF systems - Decoupling of equations of motion
2.4 Concept of mode superposition (No derivations);

Unit 3: Seismology

3.1 Elements of Seismology; Causes of Earthquake - Geological faults –
3.2 Tectonic plate theory - Elastic rebound – Epicentre; Hypocentre - Primary,
3.3 shear and Raleigh waves - Seismogram - Magnitude and intensity of earthquakes –
3.4 Magnitude and Intensity scales - Spectral Acceleration - Information on some disastrous earthquakes;

PART-B

Unit 4: Response of Structures to Earthquake

4.1 Response of Structures to Earthquake; Response and design spectra
4.2 Design earthquake - concept of peak acceleration - Site specific response spectrum
4.3 Effect of soil properties and damping - Liquefaction of soils –
4.4 Importance of ductility - Methods of introducing ductility into RC structures

Unit 5: Design Methodology

5.1 Design Methodology IS 1893, IS 13920 and IS 4326 –
5.2 Codal provisions
5.3 Design of Structural Members as per the codes

Unit 6: Earthquake control Measures

6.1 Base isolation techniques
6.2 Vibration control measures
6.3 Important points in mitigating effects of earthquake on structures

Text Books/ Reference Books:

1. S.K. Duggal,Earthquake Resistant Design of Structures, Oxford University Press.
2. T. Pauley, & M.J.N Priestley, Seismic Design of Reinforced concrete and Masonry buildings, John Willey & Sons.
3. A.K. Chopra, Dynamics of Structures, Prentice-Hall International.
4. P. Agarwal, and M. Shrikhande,Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd.
5. Jai Krishna, A.R.Chandershekaran&Brajesh Chandra, Elements of Earthquake Engineering, South Asian Publication, New Delhi.
6. Clough &Penzion, Dynamics of Structures, McGraw Hill.
7. George G. Penelis and A.J.Kapoor, Earthquake Resistant Concrete Structures, E & FN Sons, Madras.
8. Mario Paz, Structural Dynamics, CBB Publication New Delhi.

Software required / Web links:

http://nptel.ac.in/courses/105101004/
http://nptel.ac.in/courses/105108076/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-833)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-833.1	3	3	3	2	2	-	-	-	-	-	-	2	3	3
BCE-DS-833.2	3	3	3	3	2	-	-	-	-	-	-	2	3	2
BCE-DS-833.3	3	3	3	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-833.4	3	3	2	2	2	-	-	-	-	-	-	2	3	1
BCE-DS-833.5	3	3	2	3	3	-	-	-	-	-	-	3	3	2
BCE-DS-833.6	1	1	1	1	2	3	3	3	3	3	3	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act, 1956)

BCE-DS-834: GEOGRAPHIC INFORMATION SYSTEMS AND SCIENCE

Credits	3	Max. Marks	: 200
L-T-P	2-0-2	Continuous Evaluation	: 100
Examination Duration	3 hrs	End Semester Exam	: 100

Pre-requisites: Surveying & Geomatics (BCE-DS-403)
Course Type: Domain Specific Elective

Course Outcomes: At the end of this course, the student will be able to:
BCE-DS-834.1. Relate the principles of GIS into the field applications
BCE-DS-834.2. Develop map symbolization and spatial analysis
BCE-DS-834.3. Utilize various Digital Data Creating and Editing techniques
BCE-DS-834.4. Explain about Global Navigation Satellite Systems
BCE-DS-834.5 Integrate Geospatial Technologies

PART-A

Unit 1:
1.1 Introduction to GIS; Thinking Spatially Data Models;
1.2 GIS Spatial and Attribute Types
1.3 Investigation of geographic information systems (GIS) and science (GIScience) including theory and applications areas.

Unit 2:
2.1 Projections; Coordinate Systems
2.2 Datums Attribute Types, Map Types Map Symbolization
2.3 Scale; Cartography Topology
2.4 Use of a current widely-used GIS computer software system

Unit 3:
1.1 Aspects of geographic data entry and editing, map development and display
1.2 Basic Spatial Analysis: Classifying Features and selecting features by location
1.3 Attribute Data and Tables; Querying Joining or Relating Tables

PART-B

Unit 4:
4.1 Relationship of GIS to the Global Positioning System (GPS) and satellite generated data
4.2 Introduction to Remote Sensing and Image Processing
4.3 Finding and Exploring Digital Data Creating and Editing Data: Digitizing; Attributing Data
4.4 Vector Spatial Analysis & Raster Spatial Analysis

Unit 5:
5.1 Data Modeling; Sampling, Scale
5.2 Spatial Autocorrelation
5.3 Interpolation; Data Quality; Scripting

Unit 6:

6.1 Integration of Geospatial Technologies: Global Navigation Satellite Systems
6.2 GPS Basics; Data Collection Techniques and Equipment
6.3 The Future of GIS; Case Study

Text Books/ Reference Books:

1. Paul A. Longley, Michael F. Goodchild , Geographic Information Systems and Science
2. Heywood Pearson Education India, An Introduction to Geographical Information Systems.
3. Kali Charan Sahu, Remote Sensing and Geographical Information Systems Paperback

Software required/Weblinks:

https://nptel.ac.in/courses/105107155/
https://nptel.ac.in/courses/105102015/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-834)	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
BCE-DS-834.1	3	2	3	-	2	3	-	-	2	3	2	-	3	2
BCE-DS-834.2	3	3	2	-	3	3	-	-	3	-	2	2	2	1
BCE-DS-834.3	3	2	3	-	3	3	-	-	3	3	1	-	3	3
BCE-DS-834.4	3	3	3	-	3	3	-	-	3	-	3	2	2	3

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES

(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-835: Fire Resistance Construction

PerioXX/week Credits	Max. Marks: 200
L: 3 T: 0 3	Internal/Continuous Evaluation: 100
Duration of Examination: 3 Hrs	External/ End Semester Examination: 100

Pre-requisites: None

Course Type: Program Elective

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

BCE-DS-835.1: Categorize design consideration of the building
BCE-DS-835.2: Classify fire severity to design the building
BCE-DS-835.3: Design a fire resistant concrete building
BCE-DS-835.4: Design a fire resistant Steel Structures

Part A

Unit 1: Fire Resistance

1.1. Basic Concept of Fire Resistance
1.2. Process of combustion in fire
1.3. Effect of fire load & ventilation condition on enclosure fire
1.4. Growth and Decay of Fire in Enclosure

Unit 2: Design Consideration

2.1 Structural Design for Fire Condition
2.2 Design Objectives
2.3 Design Process
2.4 Loads for Structural Fire Design
2.5 Levels of Sophistication in the Design Process

Unit 3: Fire Severity

3.1 Fire Severity for Design
3.2 Standard Fire Exposure
3.3 Realistic Fire Exposure
3.4 Fire Resistance of Elements Exposed to the Standard Fire
3.5 Failure Criteria

PART B

Unit 4: Fire Resistance Design of Concrete Structures

4.1 Properties Normal Strength Concrete under Fire
4.2 Properties of High Strength concrete under fire
4.3 Properties of Steel Reinforcement under fire
4.4 Analysis of Compression Member
4.5 Analysis of Flexural Member
4.6 Shear and Torsion

Unit 5: Fire Resistance Design of Steel Structures

5.1 Steel Behavior at Elevated Temperatures
5.2 Thermal Properties of Steel
5.3 Mechanical Properties of Steel
5.4 Composite Floor Behavior at Elevated Temperatures
5.5 Design Procedure
5.6 Design of Steel column
5.7 Design of Steel Frame

5.8 Design of Steel Frame
5.9 Design of Steel Connection

Unit 6: Fire Protection Material
6.1 Spray-Applied Fire-Resistive Materials (SFRM)
6.2 Intumescent Coatings
6.3 Gypsum Board Products
6.4 Fibrous Board and Mat Products
6.5 Concrete and Masonry

Text Books/ Reference Books:

1. Bureau of Indian Standards, " HAND BOOK OF FUNCTIONAL REQUIREMENTS OF BUILDINGS, (SP-41 & SP- 32)", BIS 1987 and 1989.
2. Markus,T.A. & Morris, E.N., "BUILDING CLIMATE AND ENERGY" Pitman publishing limited. 1980.
3.Croome,J.D.&Roberts,B.M.,"AIRCONDITIONING AND VENTILATION OF BUILDINGS VOL-1".Pergamon press.
3. Building Services Design - T.W.MEVER
4. Building Engineering & System Design - F.S.MERRIT & J. AMBROSE
5. SP-35 (1987): Handbook of Water supply & drainage-BIS
6. N.B.C.-2007 BIS
7. Concept of building fire safety - D.EGAN.
8. Design of fire resisting structures - H.L. MALHOTRA. List of reference materials/books/2
9. An introduction to fire dynamics -D.DRYSDALE
10. Structural fire protection Edt by T.T.LIE
11. Elevator technology - G.C.BARNEY
12. HEATING VENTILATING AND AIR CONDITIONING Analysis and Design - Faye C. McQuiston and Jerald D. Parker.
13. Building Maintenance Management-R.LEE
14. Developments In Building Maintenance -I.EJ. GIBSON
15. Concrete Structures: materials, Maintenance And Repair D.CAMPBELL,ALLEN & H.ROPER

Software required/Weblinks:

https://nptel.ac.in/
https://swayam.gov.in/
https://nptel.ac.in/courses/105/102/105102176/

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-835	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
BCE-DS-835.1	3	2	1	1			3	2	-	3	2	3	2	2
BCE-DS-835.2	3	2	1	3	2	3			3	2	3	3	2	3
BCE-DS-835.3	3	-	1	2	2		-	3	-	-	3	2	3	2
BCE-DS-835.4	2	3	3	2	2	2	-	-	-	1	3	2	2	1

MANAV RACHNA INTERNATIONAL INSTITUTE OF RESEARCH AND STUDIES
(Deemed to be University under section 3 of the UGC Act 1956)

BCE-DS-836: Heritage Conservation
Proposed Syllabus(will be put up for approval in next BOS)

Periods/week	**Credits**	**Max. Marks**	**: 100**
L: 3 T: 0	**3**	**Internal**	**: 100**
Duration of Examination: 3 Hrs		**External**	**: 200**

Prerequisite: Basic Civil Engineering
Course Type: Interdisciplinary Elective
Course Coordinator/Co-Coordinator: PROBIR MONDAL

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

BCE-DS-836.1. Know and understand about world heritage.
BCE-DS-836.2. Understand the importance of Conserving heritage.
BCE-DS-836.3. Know about the history of conservation movement and emergence of conservation.
BCE-DS-836.4. Understand conservation approaches in cultural heritage
BCE-DS-836.5. Understand conservation approaches in geo-ecological heritage
BCE-DS-836.6. Know ex-situ & in-situ conservation.

PART-A

Unit 1: World Heritage Studies:
1.1 Concepts of World Heritage
1.2 UNESCO World Heritage Convention
1.3 Operational Guidelines, Process of inscription and monitoring, State of Conservation (SoC)
1.4 Live experience of 43rd UNESCO World Heritage Committee sessions.

Unit 2: Conserving heritage: Socio-political and Ecological Perspectives
2.1. World Heritage Conservation from global and local perspectives
2.2. Global environmental history and politics
2.3. Natural resource conflicts; Culture-nature linkages in Heritage
2.4. Ecology and the Human Interface
2.5. Heritage and Sustainable Tourism.

Unit 3: History of conservation movement and emergence of conservation
3.1. Definitions and terminologies in conservation; Principles and Approaches of conservation
3.2. Global Perspective on heritage conservation (UNESCO, IUCN, ICCROM, UNWTO)
3.3. Heritage Practice areas, Conservation Ethics, and Open source (literature pool and datasets);
3.4. Understanding Heritage: Types of Heritage
3.5. Heritage conservation - Need, Debate and purpose. Defining Conservation, History of Conservation Movement

PART-B

Unit 4: Conservation approaches in Cultural Heritage

4.1. Architectural Conservation and Historic Building Preservation;
4.2. Role of Museums; Understanding the building and composition; Basics of material science;
4.3. Preservation and restoration techniques; Sustainable Urban Planning and Rural Development; Conservation planning interventions; Role of Government organizations; Community based cultural heritage resource management;
4.4. Monument conservation and the role of Archaeological Survey of India; case studies of sites such as Hampi, Golconda, Mahabalipuram

Unit 5: Conservation approaches in Geo-ecological Heritage
5.1. Geo-ecological heritage of India and world; Opportunities and Challenge
5.2. Biodiversity loss and protected area management
5.3. Principles of ecological restoration; Protocols to monitor ecological values
5.4. Introduction to Earth History and Earth Systems; Geomorphology and Palaeontology.

Unit 6: Ex-situ & In-situ conservation
6.1. Institutional mechanism of natural heritage conservation in India
6.2 Protected Area network and its management
6.3. National Parks, Wildlife Sanctuaries, Conservation and Community Reserves, Tiger Reserves, Biosphere Reserves etc. Working plans
6.4. Management plans; basics of habitat and wildlife management; community conservation areas and wildlife outside PAs; species conservation and recovery programmes for globally threatened species including terrestrial, freshwater and marine species
6.5. Role of zoos, aquariums and botanic gardens in conservation; introduction/reintroduction and translocation.

Text/Reference Books:

1. Appleyard, D. (Ed.). (1979). The Conservation of European Cities. Massachusetts: M.I.T. Press.
2. Basu, S., Mukerji A (Eds.) (2017). Integrated Urban Conservation: An Approach towards Development, ISBN: 978-93-5268-866-1, Kharagpur: Department of Architecture and Regional Planning, IIT, Kharagpur.
3. Croci, G. (1998). The Conservation and Structural Restoration of Architectural Heritage. Southampton, UK: WIT Press.
4. Fitch, J.M. (Reprint edition 1990). Historic Preservation: Curatorial Management of the Built World. Virginia: University Press of Virginia.
5. Cullinane, J. J. (2012). Maintaining and Repairing Old and Historic Buildings. Wiley-Blackwell.
6. Evans, N.L. (2014). An Introduction to Architectural Conservation: Philosophy, Legislation and Practice. London: RIBA Publishing.
7. Feilden, B. M. (2003). Conservation of Historic Buildings. London: Routledge.
8. Glendenning, M. (2013). The Conservation Movement: A History of Architectural Preservation: Antiquity to Modernity. London: Routledge.
9. Stipe, R.E. (2003). A Richer Heritage: Historic Preservation in the Twenty-first Century. North Carolina: The University of North Carolina Press.

Software required / Web links:

https://wii.gov.in/msc_hcm_syllabus_2019

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:

Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

Course Articulation Matrix

CO Statement (BCE-DS-836)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-836.1	3	1	-	-	2	-	-	-	-	-	-	-	-	1
BCE-DS-836.2	3	2	1	2	-	-	-	-	-	-	-	-	-	1
BCE-DS-836.3	3	2	1	1	1	1	-	-	-	-	2	-	-	1
BCE-DS-836.4	2	3	3	3	3	1	-	-	-	-	-	-	2	2
BCE-DS-836.5	3	3	1	3	1	-	-	-	-	-	-	-	1	2
BCE-DS-836.6	2	3	3	2	2	3	2	-	1	2	-	1	-	3

BCE-DS-837: Water Auditing

PerioXX/week Credits	Max. Marks: 200
L: 3 T: 0 3	Internal/Continuous Evaluation: 100
Duration of Examination: 3 Hrs	External/ End Semester Examination: 100

Pre-requisites: None
Course Type: Program Elective

Course Outcomes: The students will be able to

BCE-DS-837.1 Relate to concept of water demand
BCE-DS-837.2 Apply water conservation principle
BCE-DS-837.3 Utilize water auditing laws in practical problems
BCE-DS-837.4 Recommend methodology for water auditing

PART-A

Unit 1: Introduction

1.1 Estimation of water demand
1.2 Factors affecting variation in demand, constraints.
1.3 Projections for future demands, additional demand management through treated waste water and efficient storm water management.
1.4 Existing sources of fresh water, intake structures, conveyance of water.

Unit 2: Water Conservation

2.1 Water conservation as a measure to meet future water demands
2.2 Conjunctive water use, rain water harvesting techniques, catchment planning,
2.3 Watershed management
2.4 Institutional and policy aspects with creating and understanding of the traditional practices.

Unit 2: Water Laws

3.1 An overview of water law in India
3.2 Evolution of water law, key features of water law, evolving water law and policy,
3.3 Water sector reforms, water law reforms,
3.4 The mosaic of water law.

PART-B

Unit-4: Water Conservation Practices

4.1 Water conservation as a measure to meet future water demands
4.2 Conjunctive water use, rain water harvesting techniques, catchment planning,
4.3 watershed management, institutional and policy aspects with creating and understanding of the traditional practices.

Unit-5: Water Audit Methods

5.1 Steps of water audit, water supply and usage study,
5.2 process study, discharge analysis, water audit report, benefits of water audit.
5.3 Introduction to water audit software like PODIUMSim, AWWA software, IWMI software

Unit-6: Water Audit of Sectors

6.1 Domestic sector
6.2 Industrial sector

6.3 Irrigation sector
6.4 Review of case studies

Text Books/ Reference Books:

1. Water Supply & Sanitary Engineering, G.S.Birdie, J.S.Birdie, 10th Edition, Dhanpat Rai Publishing Company (2015)
2. Water Supply Engineering, S.K.Garg, Khanna Publishers, 2010, Khanna Publishers
3. Water Law in Inda- An Introduction to Legal Instruments. 2011. Philippe Cullet and Sujith Koonan Print ISBN-13: 9780198070818, Published to Oxford Scholarship Online: September 2012
4. CPHEEO Water Manual

Instructions for paper setting: Seven questions are to be set in total. First question will be conceptual covering entire syllabus and will be compulsory to attempt. Three questions will be set from each Part A and Part B (one from each unit). Student needs to attempt two questions out of three from each part. Each question will be of 20 marks.

Distribution of Continuous evaluation table

Sessional- I	30%
Sessional- II	30%
Assignment	20%
Class Performance	10%
Attendance	10%

Assessment Tools:
Assignment/Tutorials
Sessional tests
Surprise questions during lectures/Class Performance
Term end examination

CO Statement (BCE-DS-837)	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
BCE-DS-837.1	2		1			2	3	2					3	2
BCE-DS-837.2		1					2						2	3
BCE-DS-837.3					2					3	2		3	2
BCE-DS-837.4				2				3	2	3			3	3

Appendix-A : List of courses having relevance to the Local/Regional, National and Global Development needs

Course Code	Course Name	Regional	National	Global
BPH-106	Physics for Engineers			√
BMA-102	Mathematics –I			√
BEE-101	Basic Electrical Engineering			√
BME-101	Engineering Graphics & Design			√
BPH-151A	Physics Lab			√
BEE-151A	Basic Electrical Engineering Lab			√
BHM-201	English		√	√
BHM-MC-001	Constitution of India	√	√	
BCH-106	Chemistry			√
BMA-202	Mathematics –II			√
BCS-101	Programming for Problem Solving			√
BME- 102A	Workshop / Manufacturing Practices		√	
BCH-151A	Chemistry Lab			√
BCS-151	Programming for Problem Solving Lab			√
BHM-151	English Lab			√
BCH-MC-001	EVS	√	√	
BHM-MC-004	Quantitative Aptitude			√
BHM-MC-008	Quantitative Aptitude and Personality Development-II			√

BHM-MC-009	Quantitative Aptitude and Personality Development-III			√
BCE-DS-302A	Engineering Mechanics for Civil Engineers	√	√	√
BCE-DS-305	Engineering Geology	√	√	√
BCE-DS-303	Disaster Preparedness & Planning	√	√	
DTI-300	Design, Thinking and Innovation-I		√	
BCE-DS-402	Energy Science & Engineering		√	
BCE-DS-407	Building Construction	√	√	√
BCE-DS-406	Transportation Engineering		√	√
DTI-400	Design, Thinking and Innovation-II	√	√	
BCE-DS-523	Engineering Materials for Sustainability	√	√	√
BCE-DS-606	Environmental Engineering-II	√		
BCE-DS-604A	Construction Engineering & Management	√	√	
BCE-DS-621A	Traffic Engineering and Management	√		
BCE-DS-624	Environmental Systems		√	√
BCE-DS-702A	Structural Analysis-II		√	√
BCE-DS-724	Environmental Laws and Policy		√	
BCE-DS-726	Engineering Risk & Uncertainty		√	√
BCE-DS-823	Air, Noise Pollution and Control	√	√	
BCE-DS-824A	Environmental Geo-technology	√	√	
BCE-DS-828	Sustainable Construction Methods	√	√	
BCE-DS-829	Solid and Hazardous Waste Management	√	√	
BCE-DS-831A	Repairs & Rehabilitation of Structures	√	√	
BCE-DS-832	Environmental Impact Assessment and Life Cycle Analyses	√		√

BCE-DS-833	Earthquake Engineering		√	√
BCE-DS-834	Geographic Information Systems and Science			√

Appendix-B : List of courses having focus on Employability, Entrepreneurship and Skill Development

Course Code	Course Name	Employability	Entrepreneurship	Skill development
BME-101	Engineering Graphics & Design			√
BCS-101	Programming for Problem Solving			√
BME- 102A	Workshop/Manufacturing Practices			√
BCS-151A	Programming for Problem Solving Lab			√
Proj-CE-300A	Summer Internship-I	√		
BCE-DS-302A	Engineering Mechanics for Civil Engineers			√
BCE-DS-351A	Computer-aided Civil Engineering Drawing Lab	√		
BCE-DS-406	Transportation Engineering			√
BCE-DS-403	Surveying & Geomatics	√		√
BCE-DS-453	Surveying & Geomatics Lab			√
BCE-DS-455	Transportation Engineering Lab			√
BCE-DS-503A	Structural Engineering	√		
BCE-DS-502	Geotechnical Engineering	√		
BCE-DS-552	Geotechnical Engineering Lab			√
BCE-DS-601A	Engineering Economics, Estimation & Costing	√		
BCE-DS-606	Environmental Engineering - II	√		
BCE-DS-651	Engineering Economics, Estimation & Costing Lab			√
BCE-DS-557	Environmental Engineering Lab	√		√
Proj-CE-700A	Project Phase-II		√	
Proj-CE-710	Summer Internship-III	√		

Appendix-C : List of Courses having focus on Environment and Sustainability, Professional Ethics, Human Values and Gender Equality

Course Code	Course Name	Environment and Sustainability	Professional Ethics	Human Values	Gender Equality
BCH-MC-002	Environmental Science	√			
BCE-DS-303	Disaster Preparedness & Planning	√			
BHM-MC-008	Quantitative Aptitude and Personality Development-II		√		
BHM-MC-009	Quantitative Aptitude and Personality Development-III		√		
BCE-DS-405	Energy Science & Engineering	√			
BCE-DS-422	Introduction to Sustainable development	√			
BCE-DS-423	Transformation to Green Buildings	√			
BCE-DS-523	Engineering Materials for Sustainability	√			
BCE-DS-507	Environmental Engineering-I	√			
BCE-DS-523	Engineering Materials for Sustainability	√			
BCE-DS-524	Green and Renewable Energy	√			
BCE-DS-557	Environmental Engineering Lab	√			
BCE-DS-606	Environmental Engineering - II	√			
BCE-DS-724	Environmental Laws and Policy	√			
BCE-DS-725	Physico-Chemical Processes for Water and Wastewater Treatment	√			
BCE-DS-823	Air, Noise Pollution and Control	√			
BCE-DS-824A	Environmental Geo-technology	√			
BCE-DS-828	Sustainable Construction Methods	√			

BCE-DS-829	Solid and Hazardous Waste Management	√			
BCE-DS-832	Environmental Impact Assessment and Life Cycle Analyses	√			