Programme Report

4-8 May 2026

Outcome-Based Curriculum Development for Civil Engineering

conducted at

(School of Management, Kathmandu University, Nepal)

By

Deemed to be University under Distinct Category

National Institute of Technical Teachers' Training and Research, Bhopal
(Ministry of Education, Government of India)

In Collaboration with

Nepal Engineering Council, Nepal

Coordinator: Dr R. K. Dixit, Dean Administration and Professor
Department of Civil Engineering, NITTTR, Bhopal
Faculty: Prof. Chanchal Mehra, Associate Professor, Department of Educational Technology, NITTTR, Bhopal

HIGHLIGHTS FROM THE KATHMANDU TRAINING AND LABORATORY VISIT

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Programme Report

Programme Code: NC-CONSNEP-26/26-27

Programme Title: Outcome Based Curriculum Development for Civil Engineering Programme

Duration: 04 to 08 May 2026

Venue: School of Management, Kathmandu University Nepal

1. Background

The global engineering education landscape is increasingly defined by internationally benchmarked quality frameworks, with **Outcome-Based Education (OBE)** at its core, making Nepal's pursuit of Washington Accord membership under the International Engineering Alliance (IEA) a mandatory driver for curriculum reform. To address this, a formal **Memorandum of Understanding (MOU)** was signed on **March 11, 2026**, between **NITTTR Bhopal** and the **Nepal Engineering Council (NEC)**, initiating a comprehensive capacity-building programme designed to bridge the gap between theoretical OBE principles and their practical implementation. Recognizing that faculty are the primary agents of change, this "Training of Trainers" initiative focuses on equipping educators with the expertise to articulate Outcome Based Curriculum for Undergraduate Engineering Programmes.

This report marks the completion of **Phase 1**, which successfully localized these global standards to the Nepalese context, culminating in the critical redesign of the **BE Civil Engineering programme structure** and the finalization of **course curriculum detailing format**. By achieving these deliverables, the program has established a robust foundation for meeting Washington Accord benchmarks, while simultaneously strengthening the Indo-Nepal academic partnership and ensuring that Nepal's engineering education is positioned to achieve credible, internationally recognized standards.

2. Programme Outcomes

As outlined in MOU it is expected that the participants on completion of the programme will be able to:

a) Explain principles of OBE.
b) Interpret graduate attributes/ POs, knowledge and attitude profiles.
c) Develop a programme structure for an identified programme.
d) Formulate course outcomes.
e) Review the format for course curriculum detailing.

The above have been successfully achieved on completion of the programme. (Refer Annexure 3 and Annexure 4). The detail programme brief along with training schedule that was implemented is given in ***Annexure 1***

3. Implementation Methodology: Phase 1

Phase 1 of the programme was strategically designed for in-country delivery to ensure contextual relevance and maximum faculty participation. A total of 23 faculty members from following eight universities participated in the programme.

i. Tribhuvan University
ii. Purbanchal University

iii. Kathmandu University
iv. Manmohan technical University
v. Lumbini Technical University
vi. Far Western University
vii. Mid Western University and
viii. Pokhra University

The programme was conducted at School of Management, Kathmandu University Nepal. The details of participants is given in ***Annexure 2.*** During the training participatory approach was followed that include Input cum discussion, Hands-on Exercises/ Group work, Presentations, and Tasks

4. Key Deliverables Achieved

The Phase 1 intervention was intensive and result-oriented, culminating in two specific technical outputs that will be the foundation of Phase 2 to be conducted at NITTTR, Bhopal India.

A. Redesign of the BE Civil Engineering Programme Structure

The participants successfully mapped the Civil Engineering curriculum against the IEA Graduate Attributes and Programme Outcomes as outlined by Nepal Engineering Council. This involved:

- Identifying existing curriculum gaps
- Reviewing existing course structures.
- Formulating Programme Educational Objectives (PEOs)
- Formulating Programme Specific Outcomes (PSOs)
- Integrating components as mentioned in knowledge and attitude profile into the revised programme structure.

The first draft of the programme structure for the eight Universities offering Undergraduate Programme In Civil Engineering is given in ***Annexure3.*** The unique features of revised programme structure include the following:

- Open electives, and the capstone/major project are introduced to facilitate interdisciplinary collaboration for solving complex engineering problems.
- Inclusion of emerging technologies and industry demand courses.
- Courses related to humanities and social sciences (such as Happiness and Meditation, Universal Human Values, Soft Skills, Technology, Society and Engineering Profession, Professional Ethics and Law etc.) are introduced for students' holistic development.
- Existing course titles are updated to make them more suitable for today's civil engineering context.
- Multiple engineering projects are incorporated to facilitate the development of a project addressing the societal needs.

B. Finalization of the Course Curriculum Detailing Format

To ensure uniformity across all Universities, a "Course Detailing Format" aligned to Outcome Based philosophy, was proposed by NITTTR, Bhopal. This was thoroughly discussed and was accepted by all the participants. One course detailing was attempted by participants from each university. The outcome of each university is given in ***Annexure 4.***

5. Strategic Significance of Phase 1 Training

This collaboration marks a pivotal step in strengthening the Indo-Nepal academic partnership. By accepting the outcome based curriculum framework and building local faculty capacity, this initiative provides the essential foundation for Nepal's successful and credible bid for Washington Accord membership.

Phase 1 has successfully transitioned the theoretical mandate of the NEC into a practical, implementable roadmap. The first draft of BE Civil Engineering Programme Structure will carried forward into Phase 2 at NITTTR, Bhopal, where faculty will gain exposure to design course curriculum and the rubrics.

राष्ट्रीय तकनीकी शिक्षक प्रशिक्षण एवं अनुसंधान संस्थान, भोपाल

(सम-विश्वविद्यालय-विशिष्ट श्रेणी)

National Institute of Technical Teachers' Training & Research, Bhopal

(Deemed -to -be University under Distinct Category)

Annexure 1

Programme Brief

Programme Code: NC-CONSNEP-26/26-27

Programme Title: Outcome Based Curriculum Development for Civil Engineering Programme

Duration: 04 to 08 May 2026

Venue: Kathmandu University Nepal

1. Rationale:

The global engineering education landscape is increasingly governed by internationally benchmarked quality frameworks, with Outcome-Based Education (OBE) at their core. Nepal's pursuit of Washington Accord membership under the International Engineering Alliance (IEA) has made the adoption of OBE not just desirable but mandatory.

In this view, as per the Memorandum of Understanding (MOU) between NITTTR, Bhopal, Deemed to be University under Distinct Category (Ministry of Education, Government of India) and the Nepal Engineering Council (NEC) signed on 11/03/2026, Capacity building Programmes on "*Outcome-Based Curriculum Development for the engineering faculty of Nepal" are planned to* be conducted.

The Washington Accord requires that member institutions demonstrate measurable graduate competencies aligned with global engineering standards. Engineering colleges under the Nepal Engineering Council (NEC) must therefore redesign their curricula in conformity with OBE principles. This transformation involves articulating Programme Educational Objectives (PEOs), Programme Outcomes (POs), and Course Outcomes (COs). However, such reform cannot succeed without first building the capacity of faculty, who are the primary implementers of any curriculum change. Recognising this gap, NITTTR Bhopal — a premier institution under the Ministry of Education, Government of India, has been entrusted to undertake the task of Training of Trainers for faculty of Nepal.

NITTTR Bhopal brings decades of expertise in technical teacher training, curriculum development, and academic quality assurance to this assignment. The proposed series of training programmes is designed to bridge the knowledge and skill gap among faculty regarding OBE concepts and their practical application in curriculum design. It will also cover constructive alignment, outcome formulation, OBE-driven pedagogy, and outcome-based assessment strategies.

The proposed training initiative will be delivered in two phases, each of five days' duration. The first phase will comprise four programmes to be conducted at different locations across Nepal, while the second phase will host four programmes at NITTTR, Bhopal. NEC, Nepal, will identify and depute faculty members from various disciplines of engineering colleges to participate as trainees. This two-phase structure is deliberately designed to ensure both contextual relevance through in-country delivery and international

academic exposure through the India-based component, thereby maximising the overall learning impact of the training initiative.

At the end of the training programmes, the participants will be able to redesign existing course curricula to meet Washington Accord benchmarks. The programme is structured to be intensive yet practical, ensuring faculty are updated with ready-to-implement curriculum reform aspects. This collaboration between NITTTR Bhopal and NEC, Nepal, represents a significant step in strengthening Indo-Nepal academic partnerships. It reflects a shared commitment to elevate engineering education quality in Nepal to internationally recognised standards. This training initiative will serve as the foundation for Nepal's credible and successful bid for Washington Accord membership.

Phase 1 of Training:

This Capacity Development Programme on "Outcome-Based Curriculum Development" Phase 1 aims to equip faculty with the knowledge and skills needed to design curriculum structures that integrate the principles and practices of outcome-based education, in alignment with IEA standards.

2. Programme Outcomes:

a) Explain principles of OBE.
b) Interpret graduate attributes/ POs, knowledge and attitude profiles.
c) Develop a programme structure for an identified programme.
d) Formulate course outcomes.
e) Review the format for course curriculum detailing.

3. Programme Contents

- Concepts and principles of Outcome-Based Education (OBE).
- Three pillars of OBE: Outcome-Based Curriculum, Outcome-Based Teaching and Learning, Outcome-Based Assessment.
- Graduate Attributes, introduction to GAPC, Knowledge and Attitude profile.
- Domains of learning.
- Outcome-Based Curriculum Development approach.
- Components of Outcome-Based Curriculum.
- Writing course outcomes.
- Draft Course Curriculum format.

4. Instructional Strategy:

- Input cum discussion
- Hands-on Exercises/ Group work
- Presentations, Assignments, Tasks

5. **Target Group:** Faculty members of Faculty of Civil Engineering from different universities of Nepal.

6. Coordinator & Faculty details:

a. Dr. Rajesh Dixit, Professor and Dean Administration, NITTTR Bhopal
Tel. No. (O): + 91 (755) 2661600 – 02 Extn. 370
Mobile No: 9425163874
E-mail ID: rkdixit@nitttrbpl.ac.in

b. Prof. (Mrs.) Chanchal Mehra, NITTTR Bhopal
Tel. No. (O): + 91 (755) 2661600 – 02 Extn. 443
Mobile No: 8109585310
E-mail ID: cmehra@nitttrbpl.ac.in

7. Tentative Schedule:

Date	Session I (10.00 AM to 11.15 AM)	Session II (11.45 AM to 01.00 PM)	Session III (02.00 PM to 03.15 PM)	Session IV (03.45 PM to 05.00 PM)
Day-1	• Registration • Inaugural Session • Introduction to Programme Brief	• Concepts and Principles of OBE • OBC, OBTL and OBA Frameworks • Architecture of OBE	• Introduction to GAPC and International Accords • Programme outcomes/ Graduate Attributes for Engineers	Knowledge and Attitude Profiles in OBE
Day-2	Domains of Learning	Outcome-Based Curriculum Development Approach	**Task-1:** Identify Existing Curriculum Gaps	• Programme Structure • Components of an Outcome-Based Curriculum
Day-3	**Task-2:** Develop Programme Structure for the identified Programme	Continued	Presentation and feedback on Draft Programme Structure	Sample Course Detailing Format
Day-4	Course Outcomes	**Task-3:** Formulate COs and create CAM for the selected Course(s)	Continued	Presentation and feedback of COs
Day-5	• Review and finalise the course curriculum format • Develop draft course curriculum for sample course(s)		Presentation and Feedback	Valedictory and Phase 1 Wrap-up

Participant List "Outcome Based Curriculum Development for Civil Engineering Programme" 4-8 May 2026 at Katmandu university, Nepal

Annexure 2

SN	Regd Id	Participant Name	Org. Name	University	Email	MobileNo
1	2551	Arun Kumar Bhandari	Everest Engineering College	Pokhara University	arun.bhandari@eemc.edu.np	9851199795
2	2549	Anand Dev Bhatt	School of Engineering, Pokhara University	Pokhara University	bhattanand39@gmail.com	9848782126
3	2539	Dev Raj Joshi	Aryan School of Engineering	Pokhara University	drj.devrajjoshi@gmail.com	9851243127
4	2538	Hari Krishna Shrestha	Everest Engineering College	Pokhara University	hari@eemc.edu.np	9851006010
5	2544	Santosh Khanal	School of Engineering,Pokhara University	Pokhara University	santoshkhanal@pu.edu.np	9843427687
6	2546	Padma Bahadur Shahi			shahipadma07@gmail.com	9851091057
7	2586	Shreekrishna Neupane	Pokhara University	Pokhara University	shreekrishna1@gmail.com	9851133620
8	2563	Arun Prasad Parajuli	Sagarmatha Engineering College	Tribhuban University	arun.parajuli@sagarmatha.edu.np	9841271076
9	2559	Gunanidhi Lamsal	National Cllege of Engineering	Tribhuvan University	gnlamsal2039@gmail.com	9849089315
10	2561	Harshikesh Karna	Kathmandu Engineering College	Tribhuvan University	Hkarna03@gmail.com	9849947696
11	2540	Abhinesh khatri	Kantipur Engineering College	Tribhuvan University	Khatriabhinesh@gmail.com	9847075545
12	2560	Pradeep Shrestha	Himalaya College of Engineering	Tribhuvan University	pradeep.shrestha9391@gmail.com	9849663350
13	2545	Birendra Kumar Bohara	Far Western University	Far Western University	bbohara2@gmail.com	9848826320
14	2548	Trilok Chandra Bist	Far western University	Far western University	trilokbist04@gmail.com	9846449503
15	2541	Kailash Chaudhary	Manmohan Technical university	Manmohan Technical university	kailash.chaudhary@mtu.edu.np	9851133763
16	2542	Niswan Dhakal	Manmohan Technical University	Manmohan Technical University	niswan.dhakal@mtu.edu.np	9851238360
17	2552	Narayan Ghimire	Lumbini Technological University	Lumbini Technological University	narayan.ghimire@ltu.edu.np	9814125888
18	2547	Prakash Regmi	Mid- West University	Mid- West University	prakash.regmi@mu.edu.np	9844873896
19	2562	Santosh Chaudhary	Kathmandu University	Kathmandu University	santosh.chaudhary30045@gmail.com	9851234516
20	2575	Shyam Sundar Khadka	Kathmandu University	Kathmandu University	shyamskhadka@gmail.com	9841307410
21	2543	Rabin Bhattarai	Purbanchal University school of Engineering	Purbanchal University	rabin568@gmail.com	985206318
22	2550	Sujan Maka	Khwopa Engineering College	Purbanchal University	sujanmaka@khec.edu.np	9851141251
23	2553	Samit Thapa	Hillside College of Engineering, Purbanchal University	Purbanchal University	thapasamit.nepali@gmail.com	9851242692

NATIONAL INSTITUTE OF TECHNICAL TEACHERS' TRAINING & RESEARCH, SHAMLA HILLS, BHOPAL MADHYA PRADESH

Name of Programme :Outcome Based Curriculum Development for Civil Engineering Programme
Course Code :NC-CONSNEP-26/2026-2027
Duration :04-05-2026 To 08-05-2026
Venue :Kathmandu University, Nepal
Co-ordinator R.K. Dixit

Attendance Sheet

Sl. No.	Name of the Participant Organization	Arrival (Date, Time & Sign)	Departure (Date, Time & Sign)	Day 1 (04-05-2026)	Day 2 (05-05-2026)	Day 3 (06-05-2026)	Day 4 (07-05-2026)	Day 5 (08-05-2026)	Qualified for Certificate (Yes/No)
1	Arun Kumar Bhandari Everest Engineering College, Pokhara University								
2	Arun Prasad Parajuli ~~Tribhuvan University, Nepal~~ Sagarmatha Engineering College								
3	Birendra Kumar Bohara Far Western University								
4	Anand Dev Bhatt School of Engineering, Pokhara University								
5	Dev Raj Joshi Aryan School of Engineering								

Note: The original copy of this attendance sheet(dully signed by course coordinator) will be sent on the last day of training till 11.30 AM to POC for issuing certificate .

(R.K. Dixit)
Course Coordinator(NC-CONSNEP-26/2026-2027)

Sl. No.	Name of the Participant Organization	Arrival (Date, Time & Sign)	Departure (Date, Time & Sign)	Day 1 (04-05-2026)	Day 2 (05-05-2026)	Day 3 (06-05-2026)	Day 4 (07-05-2026)	Day 5 (08-05-2026)	Qualified for Certificate (Yes/No)
6	Gunanidhi Lamsal National College of Engineering								
7	Hari Krishna Shrestha Everest Engineering College								
8	Harshikesh Karna Kathmandu Engineering College								
9	Kailash Chaudhary Manmohan Technical university								
10	Abhinesh khatri Kantipur Engineering College								

Note: The original copy of this attendance sheet(dully signed by course coordinator) will be sent on the last day of training till 11.30 AM to POC for issuing certificate .

(R.K. Dixit)
Course Coordinator(NC-CONSNEP-26/2026-2027)

Sl. No.	Name of the Participant Organization	Arrival (Date, Time & Sign)	Departure (Date, Time & Sign)	Day 1 (04-05-2026)	Day 2 (05-05-2026)	Day 3 (06-05-2026)	Day 4 (07-05-2026)	Day 5 (08-05-2026)	Qualified for Certificate (Yes/No)
11	Narayan Ghimire Lumbini Technological University								
12	Niswan Dhakal Manmohan Technical University								
13	Pradeep Shrestha Himalaya College of Engineering								
14	Prakash Regmi Graduate school of Engineering Mid- West University								
15	Rabin Bhattarai Purbanchal University School of Engineering								

Note: The original copy of this attendance sheet(dully signed by course coordinator) will be sent on the last day of training till 11.30 AM to POC for issuing certificate .

(R.K. Dixit)
Course Coordinator(NC-CONSNEP-26/2026-2027)

SI. No.	Name of the Participant Organization	Arrival (Date, Time & Sign)	Departure (Date, Time & Sign)	Day 1 (04-05-2026)	Day 2 (05-05-2026)	Day 3 (06-05-2026)	Day 4 (07-05-2026)	Day 5 (08-05-2026)	Qualified for Certificate (Yes/No)
16	Santosh Chaudhary Kathmandu University								
17	Santosh Chaudhary Kathmandu University								
18	Santosh Khanal School of Engineering,Pokhara University								
19	Padma Bahadur Shahi Pokhara University								
20	Shreekrishna Neupane Pokhara University								

Note: The original copy of this attendance sheet(dully signed by course coordinator) will be sent on the last day of training till 11.30 AM to POC for issuing certificate .

(R.K. Dixit)
Course Coordinator(NC-CONSNEP-26/2026-2027)

SI. No.	Name of the Participant Organization	Arrival (Date, Time & Sign)	Departure (Date, Time & Sign)	Day 1 (04-05-2026)	Day 2 (05-05-2026)	Day 3 (06-05-2026)	Day 4 (07-05-2026)	Day 5 (08-05-2026)	Qualified for Certificate (Yes/No)
21	Shyam Sundar Khadka Kathmandu University								
22	Sujan Maka Khwopa Engineering College								
23	Samit Thapa Hillside college of Engineering, Purbanchal University								
24	Trilok Chandra Bist Far Western University								

Note: The original copy of this attendance sheet(dully signed by course coordinator) will be sent on the last day of training till 11.30 AM to POC for issuing certificate .

(R.K. Dixit)
Course Coordinator(NC-CONSNEP-26/2026-2027)

Annexure 3

Revised Programme Structure for Under Graduate Programme in Civil Engineering of

1. Tribhuvan University
2. Purbanchal University
3. Kathmandu University
4. Manmohan Technical University
5. Lumbini Technical University
6. Far Western University
7. Mid Western University and
8. Pokhra University

Task – 2

Title – Design & Development of Programme Structure with Teaching & Examination Scheme for the Identified Programme

Name of the University -Tribhuvan University

Programme Title – Bachelor in Civil Engineering

1. Introduction:

Tribhuvan University, Nepal's Premier Institution of Higher Education established in 1959, located at Kritipur, Kathmandu, Nepal. Among its five institutes, Institute of Engineering (IOE) is located at Pulchowk, Lalitpur is covering engineering education, having five constituent campuses and ten affiliated colleges.

2. Vision & Mission Statements of the University:

Vision:

- Ensure academic quality aligned with international standards and establish TU as a credible central university with higher global ranking.
- Enhance the quality of academic programs and research output.

Mission:

- Serve as Nepal's national hub for teaching, research, and knowledge enterprise.
- Promote collaborative efforts among researchers, academics, government, and development agencies.
- Provide training and development services to academic institutions and communities at national and global levels.
- Deliver world-class research programs recognized internationally.

3. Vision & Mission Statements of the Department

Vision:

- To be recognized as a premier engineering education institution comparable to world-class role models.
- To establish itself as a center of excellence in civil engineering education and research.
- To contribute to national development through innovative engineering solutions.

Mission:

- Provide quality civil engineering education relevant to Nepal's socio-economic and infrastructural needs.
- Conduct research in frontier engineering areas that directly benefit the nation.
- Strengthen collaboration between academia, industry, and government.
- Promote sustainable engineering practices to address environmental and societal challenges.

- Develop competent engineers capable of competing globally while serving local needs.

4. Programme Educational Objectives (PEOs):

- Graduates will be prepared with a **solid foundation** in mathematics, science, and technical subjects crucial for **analyzing and designing civil infrastructure systems**.
- Graduates will be acquainted with current and emerging global issues in civil engineering while upholding moral and ethical responsibilities toward society.
- Graduates will have the capability to obtain professional engineering licensure and a passion for engaging in lifelong learning.
- Graduates will be qualified for employment as civil engineers, for further advanced study, and for taking on entrepreneurial roles in the long run.

5. Programme Outcomes (POs): -

PO-1 **Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in Knowledge and Attitude Profiles (KA1 to KA4) respectively to develop solutions to complex engineering problems.

PO-2 **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development (KA1 to KA4).

PO-3 **Design/development of solutions:** Design creative solutions for complex engineering problems and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole- life cost, net zero carbon as well as resources, cultural, societal, and environmental considerations as required (KA5)

PO-4 **Investigation:** Conduct investigations of complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (KA8). Complex engineering problems are referred to as the problems:

- that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline as against problems given at the end of chapters in a typical textbook that can be solved using simple engineering theories and techniques;
- that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions;
- that require consideration of appropriate constraints / requirements not explicitly given in the problem statement such as cost, power requirement, durability, product life, etc.;
- which need to be defined (modelled) within appropriate mathematical framework; and
- that often require use of modern computational concepts and tools, for example, in the design of an earthquake resistant building.

PO-5 **Modern Tool Usage:** Create, select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering problems (KA2 and KA6)

PO-6 **The Engineer and the Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices (KA7).

PO-7 **Ethics:** Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (KA9)

PO-8 **Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multidisciplinary, face- to-face, remote and distributed settings (KA9)

PO-9 **Communication:** Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, making effective presentations, taking into account cultural, language, and learning differences.

PO-10 **Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO-11 **Lifelong learning:** Recognize the need for, and have the preparation and ability for:

- independent and life-long learning,
- adaptability to new and emerging technologies, and
- critical thinking in the broadest context of technological change (KA8)

Knowledge and Attitude Profiles (KAs)

KA-1 **Natural and social science:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

KA-2 **Mathematics:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

KA-3 **Engineering fundamentals:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

KA-4 **Specialist knowledge:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

KA-5 **Engineering design & operations:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

KA-6 **Engineering practice:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

KA-7 **Role of Engineering in society:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

KA-8 **Research literature:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

KA-9 **Ethics and conduct:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Specific Outcomes (PSOs):

PSO-1 Demonstrate in-depth knowledge of core civil engineering to evaluate, analyze, and synthesize solutions for infrastructure challenges and engage continuous future research and studies.

PSO-2 Utilize modern computational tools, surveying technologies, and project management methodologies to plan, construct, and maintain engineering systems, while functioning effectively in multidisciplinary teams with strong entrepreneurship and communication skills.

7. Total Programme Structure with Teaching and Examination Scheme (Semester Wise):

1.	**Title of UG Engg./ Tech. Programme**	:	Bachelors in Civil Engineering
2.	**Duration of Programme**	:	Four Years
3.	**Entry Qualification**	:	+2 or Diploma in Engineering
4.	**Total Marks**	:	4600
5.	**Total Credits**	:	125
6.	**Total Number of Courses**	:	42
7.	**Qualification Awarded**		
	BE/ B.Tech.	:	Credits

8. Summary of Credits and Marks:

Year	Semester	Credits	Total Marks
Year -1	Semester -I	16	525
	Semester - II	17	625
Total		**33**	**1150**
Year -2	Semester -III	17	575
	Semester - IV	19	775
Total		**36**	**1350**
Year -3	Semester -V	19	775
	Semester- VI	17	725
Total		**36**	**1500**
Year -4	Semester -VII	12	400
	Semester - VIII	8	300
Total		**20**	**600**
Grand Total		**125**	**4600**

8. Suggested Category wise Courses:

S. No.	Course Category	Abbreviations	Number of Courses	Total Credits
1.	Applied Science Courses	ASC	5	13
2.	Engineering Science Courses	ESC	10	34
3.	Programme Core Courses	PCC	15	44
4.	Programme Elective Courses	PEC	2	6
5.	Open Electives Courses	OEC	1	3
6.	Humanities, Social Science and Management Courses	HSC	3	7
7.	Project, Internship and Industrial Training	PI	6	16
Total			**42**	**125**

Bachelors in Civil Engineering **Semester - I**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CE ASC101	ASC	Engineering Mathematics I	3	3	2	-	5	40	60	-	-	100
	CE ASC102	ASC	Engineering Chemistry	2	2	1	2	5	20	30	25	-	75
	CE ESC101	ESC	Engineering CA Drawing	2	2	-	3	5	20	30	-	-	50
	CE ESC102	ESC	Computer Programming	3	3	1	2	6	40	60	25	-	125
	CE PCC101	PCC	Civil Engineering Materials	2	2	-	1	3	20	30	25	-	75
	CE ESC103	ESC	Engineering Mechanics	4	4	2	-	6	40	60	-	-	100
			Sub Total	16									525

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Bachelors in Civil Engineering. **Semester - II**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CE ASC201	ASC	Engineering Mathematics II	3	3	2	-	5	40	60	-	-	100
	CE ASC202	ASC	Engineering Physics	2	2	1	2	5	20	30	25	-	75
	CE HSC201	HSC	Technical Communication & Writing Skills	2	2	-	1	3	20	30	25	-	75
	CE ESC201	ESC	Mechanics of Solid	3	3	1	2	6	40	60	25	-	125
	CE ESC202	ESC	Engineering Survey	4	3	1	4	8	40	60	25	-	125
	CE ESC203	ESC	Engineering Geology	3	3	1	2	6	40	60	25	-	125
			Sub Total	17									625

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Bachelors in Civil Engineering **Semester - III**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CE ASC301	ASC	Probability, Statistics & Numerical Methods	3	3	2	-	5	40	60	-	-	100
	CE ESC301	ESC	Analysis of Structures	4	4	1	1	6	40	60	25	-	125
	CE ESC302	ESC	Water Resource Engineering	4	4	1	1	6	40	60	25	-	125
	CE PCC301	PCC	Building Technology	2	2	1	-	3	20	30	-	-	50
	CE PCC302	PCC	Concrete Technology	2	2	1	1	4	20	30	25	-	75
	CE PI301	PI	Survey Camp	2	-	-	-	-	-	-	50	50	100
			Sub Total	17									575

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Bachelors in Civil Engineering. **Semester - IV**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CE PCC401	PCC	Design of Masonry and Timber Structures	3	3	1	1	5	40	60	25	-	125
	CE ESC401	ESC	Engineering Hydrology	3	3	1	1	5	40	60	25	-	125
	CE ESC402	ESC	Geotechnical Engineering	4	4	1	1	6	40	60	25	-	125
	CE HSC401	HSC	Engineering Economics	3	3	1	-	4	40	60	-	-	100
	CE PCC402	PCC	Estimation and Costing	3	3	1	-	4	40	60	-	-	125
	CE OEC501	OEC	Elective (open)	3	3	1	1	5	40	60	25	-	125
			Sub Total	19									725

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Bachelors in Civil Engineering. **Semester - V**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CE PCC501	PCC	Design of Steel Structures	3	3	1	-	4	40	60	-	-	100
	CE PCC502	PCC	Environmental Engineering	4	4	1	1	6	40	60	25	-	125
	CE PCC503	PCC	Irrigation & Water Power Engineering	4	4	1	1	6	40	60	25	-	125
	CE PCC504	PCC	Transportation Engineering	3	3	1	1	5	40	60	25	-	125
	CE PI501	PI	Research Methodology	2	2	-	-	2	20	30	-	-	50
	CE PEC601	PEC	Elective I	3	3	1	1	5	40	60	25	-	125
			Sub Total	19									775

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Bachelors in Civil Engineering.. **Semester - VI**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CE PCC601	PCC	Design of RCC Structures	3	3	1	-	4	40	60	-	-	100
	CE PCC602	PCC	Disaster Management & Emergency Planning	3	3	1	1	5	40	60	25	-	125
	CE PCC603	PCC	Procurement, Construction and Project Management	3	3	-	-	3	40	60	-	-	100
	CE PCC604	PCC	Transportation Intelligence System	3	2	1	-	3	40	60	-	-	100
	CE OEC601	OEC	Fundamental of AI and ML in Civil Engineering	2	2	-	1	3	20	30	-	-	50
	CE PEC601	PEC	Elective II	3	3	1	1	5	40	60	25	-	125
			Sub Total	17									725

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Bachelors in Civil Engineering. **Semester - VII**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CE PCC701	PCC	Sustainable and Low Cost Techniques	3	3	1	2	6	40	60	25	-	125
	CE PCC702	PCC	Repair, Maintainace & Retrofitting Engineering	3	3	1	1	5	40	60	25	-	125
	CE HSC701	HSC	Technology, Society and Engineering Profession	2	2	-	-	2	20	30	-	-	50
	CE PI701	PI	Major Project I	2	-	-	-	-	-	-	50		50
	CE PI702	PI	Entrepreneurship Development & Startup	2	2	-	-	2	20	30			50
			Sub Total	12									400

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Bachelors in Civil Engineering….. **Semester - VIII**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CE PI801	PI	Major Project II	2	-	-	-	-			50	50	100
	CE PI802	PI	Internship	6	-	-	-				100	100	200
			Sub Total	8									300

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Task – 2

Title – Design & Development of Programme Structure with Teaching & Examination Scheme for the Identified Programme

Name of the University – Purbanchal University

Programme Title – BE Civil Engineering

1. **Introduction:**

Purbanchal University (PU) was established by the government of Nepal in 1994 with the aim of decentralizing higher education and expanding opportunities for education across Nepal. One of the key objectives of PU was to develop higher education in the country in a decentralized manner and extend the reach of higher education to various regions. PU plays a significant role in promoting socio-economic transformation in Nepal through the provision of quality education that is appropriate for a quality life and sustainable future.

Since its establishment, PU has become a beacon of hope for both urban and rural communities, especially for those who aspire to attain higher education within the country. The university offers an affordable fee structure, making education accessible to a wider population. Its expansive campus, spanning over 545 hectares in rural settings of Koshi Province Nepal, provides an ideal environment for learning and personal growth.

2. **Vision & Mission Statements of the University:**

To develop this university as the model in fulfilling the national objectives of education'.

Objectives:

- *Run professional and Technical Institutions of Career-oriented higher Education facilitating study, research and teaching programs related to various disciplines and promote all around development of its student, teachers and scholars abilities and personalities;*
- *Contribute to the creation of a comparative high competitive environment in higher education by extending and disseminating knowledge by fostering its efficient and effective application;*
- *Mobilize and utilize resources-local, national or International- with a view of introducing improvement in the quality and effectiveness of its academic programs catering for the changing socio-economic needs of the country;*

- *Develop as model institution of higher learning by correcting academic weaknesses of both public and private Institutions*

3. Vision & Mission Statements of the Department:

Vision:

To become the center of excellence in engineering education and research in South Asia.

Mission:

Our Mission is to produce engineering graduates with both a strong base of technical knowledge and the complementary skills needed to be successful professional engineers in the modern world. This faculty is committed to promote stronger linkage between industry, engineering community and institutions.

4. Programme Educational Objectives (PEOs):

- **Will make the Successful career in Engineering or profession.**
- **Apply Civil engineering knowledge for sustainable practice.**
- **Exhibit leadership and Research skills to solve societal problem through teamwork.**
- **Pursue lifelong learning & professional development to address emerging challenges.**

5. Programme Outcomes (POs): - As per NEC

PO-1 Engineering Knowledge: Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in Knowledge and Attitude Profiles (KA1 to KA4) respectively to develop solutions to complex engineering problems.

PO-2 Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development (KA1 to KA4).

PO-3 Design/development of solutions: Design creative solutions for complex engineering problems and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole- life cost, net zero carbon as well as resources, cultural, societal, and environmental considerations as required (KA5)

PO-4 Investigation: Conduct investigations of complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (KA8). Complex engineering problems are referred to as the problems:

- that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline as against problems given at the end of chapters in a typical textbook that can be solved using simple engineering theories and techniques;
- that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions;
- that require consideration of appropriate constraints / requirements not explicitly given in the problem statement such as cost, power requirement, durability,

product life, etc.;

- which need to be defined (modelled) within appropriate mathematical framework; and
- that often require use of modern computational concepts and tools, for example, in the design of an earthquake resistant building.

PO-5 Modern Tool Usage: Create, select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering problems (KA2 and KA6)

PO-6 The Engineer and the Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices (KA7).

PO-7 Ethics: Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (KA9)

PO-8 Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multidisciplinary, face- to-face, remote and distributed settings (KA9)

PO-9 Communication: Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, making effective presentations, taking into account cultural, language, and learning differences.

PO-10 Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO-11 Lifelong learning: Recognize the need for, and have the preparation and ability for:

- independent and life-long learning,
- adaptability to new and emerging technologies, and
- critical thinking in the broadest context of technological change (KA8)

Knowledge and Attitude Profiles (KAs)

KA-1 Natural and social science: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

KA-2 Mathematics: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

KA-3 Engineering fundamentals: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

KA-4 Specialist knowledge: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

KA-5 Engineering design & operations: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

KA-6 Engineering practice: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

KA-7 Role of Engineering in society: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

KA-8 Research literature: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

KA-9 Ethics and conduct: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Specific Outcomes (PSOs):

PSO-1 Plan, analyze, design, implement and manage civil engineering projects with sustainable development goal aspects.

PSO-2 Incorporate the research in solving emerging civil engineering challenges.

PSO-3 Provide innovative solution for earthquake resilient structure.

7. Total Programme Structure with Teaching and Examination Scheme (Semester Wise):

1.	**Title of UG Engineering Programme**	:	Civil Engineering
2.	**Duration of Programme**	:	Four Years
3.	**Entry Qualification**	:	+2 in science or equivalence
4.	**Total Marks**	:	5050
5.	**Total Credits**	:	134
6.	**Total Number of Courses**	:	47
7.	**Qualification Awarded**		BE Civil Engineering
	BE/ B.Tech.	:	Credits

8. Summary of Credits and Marks:

Year	Semester	Credits	Total Marks
Year -1	Semester -I	18	800
	Semester - II	19	725
Total			
Year -2	Semester -III	18	650
	Semester - IV	19	725
Total			
Year -3	Semester -V	18	675
	Semester- VI	17	625
Total			
Year -4	Semester -VII	13	500
	Semester - VIII	12	350
Total			
Grand Total		**134**	**5050**

8. Suggested Category wise Courses:

S. No.	Course Category	Abbreviations	Number of Courses	Total Credits
1.	Applied Science Courses	ASC	7	22
2.	Engineering Science Courses	ESC	5	10
3.	Programme Core Courses	PCC	19	62
4.	Programme Elective Courses	PEC	3	9
5.	Open Electives Courses	OEC	2	4
6.	Humanities, Social Science and Management Courses	HSC	8	18
7.	Project, Internship and Industrial Training	PI	3	9
Total			**47**	**134**

UG Engg. Programme in Civil Engineering **Semester - I**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		ASC	Fundamental Mathematics	3	3	3	-	6	40	-	60	-	100
		ASC	Environmental Chemistry	3	3	1	2	6	40	25	60	-	125
		PCC	Applied Mechanics	3	3	3	-	6	40	-	60	-	100
		PCC	Civil Engineering Materials	3	3	-	3	6	40	25	60	-	125
		ESC	Engineering Drawing	2	1	-	3	4	-	60	-	40	100
		ESC	Computer Programming	2	2	-	2	4	40	25	60	-	125
		HSC	Academic Writing Skill	2	2	-	2	4	40	25	60	-	125
				18				36					800

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Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. Programme in Civil Engineering **Semester - II**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		ASC	Applied Mathematics	4	4	4	-	8	40	-	60	-	100
		ASC	Semiconductor Physics	3	3	1	2	6	40	25	60	-	125
		PCC	Strength of Materials	3	3	1	2	6	40	25	60	-	125
		PCC	Surveying & Geomatics	3	2	1	3	6	40	25	60	-	125
		ESC	Engineering Geology	2	2		2	4	40	25	60	-	125
		PCC	Water Resource Engineering	4	4	2	2	8	40	25	60	-	125
				19				38					725

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in Civil Engineering **Semester - III**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		ASC	Probability & Statistics for Data Analysis	3	3	1	2	6	40	25	60	-	125
		PCC	Building Technology & Construction Techniques	3	3	-	3	6	40	25	60	-	125
		PCC	Structural Analysis	4	3	3	2	8	40	25	60	-	125
		PCC	Concrete Technology and Masonry Structures	3	3	1	2	6	40	25	60	-	125
		ESC	Civil Engineering Drawing and Modelling	2	1	-	3	4		50		-	50
		PCC	Estimation and Valuation	3	3	3	-	6					100
				18				36					650

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in Civil Engineering **Semester - IV**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		PCC	Geotechnical Engineering	4	4	2	2	8	40	25	60	-	125
		ASC	Numerical Methods	3	3	1	2	6	40	25	60	-	125
		PCC	Transportation Engineering	4	4	2	2	8	40	25	60	-	125
		PCC	Engineering Hydrology	2	2	1	1	4	40	25	60	-	125
		PCC	Design of Steel and Timber Structure	3	3	2	1	6	40	25	60	-	125
		PCC	Survey Camp	3	-	-	6	6	-	75	-	25	100
				19				38					725

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in Civil Engineering **Semester - V**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		PCC	Irrigation Engineering	3	3	2	1	6					100
		PCC	Environmental Engineering	4	4	2	2	8					125
		HSC	Engineering Economics & Finance	3	3	3	-	6					100
		ESC	AI/ML for Civil Engineering	2	2	-	2	4					125
		PCC	Design of Reinforced concrete structure	4	3	3	2	8					125
		OEC	Open Electives Course -I	2	2	-	2	4					100
				18				36					675

Legend:

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Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in Civil Engineering **Semester - VI**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		PCC	Hydropower Engineering	3	3	1	2	6					125
		PCC	Bridge & Tunnel Engineering	3	3	1	2	6					100
		HSC	Safety Engineering	2	2	-	2	4					100
		HSC	Construction Project Management	3	3	1	2	6					100
		PEC	Program Elective Course -I	3	3	1	2	6					100
		ASC	Finite Element Analysis	3	3	1	2	6					100
				17				34					625

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in Civil Engineering **Semester - VII**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		HSC	Engineering Professional Practice	2	2	-	2	4					100
		PEC	Program Elective Course II	3	3	1	2	6					100
		HSC	Universal Human Values	2	2	-	2	4					50
		HSC	Research in Emerging Issues	2	2	-	2	4					100
		OEC	Open Electives Course -II	2	2	-	2	4					100
		PI	Minor Project	2	2	-	2	4					50
				13				26					500

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in Civil Engineering **Semester - VIII**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		PI	Internship	3	1	-	5	6					100
		PEC	Program Elective Course III	3	3	1	2	6					100
		PI	Major Project	4	2	-	6	8					100
		HSC	Soft Skill	2	2	-	2	4					50
				12				24					350

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Task – 2

Title – Design & Development of Programme Structure with Teaching & Examination Scheme for the Identified Programme

Name of the University – Kathmandu University

Programme Title – Bachelor in Civil Engineering

1. Introduction:

The Bachelor in Civil Engineering programme is designed to produce competent civil engineers with strong foundations in engineering science, design, analysis, construction technology, hydropower engineering, transportation, environmental engineering, and project management. The curriculum integrates theory, laboratory work, field practice, project-based learning, and internship experiences.

2. Vision & Mission Statements of the University:

The vision is *"to become a world-class university devoted to bringing knowledge and technology to the service of mankind"*.

The mission statement of the University is *"to provide quality education for leadership"*.

3. Vision & Mission Statements of the Department

Vision: To become a leading department in civil engineering education, research, innovation, and sustainable infrastructure development.

Mission: To prepare competent civil engineers capable of solving national and global infrastructure challenges through engineering knowledge, ethics, innovation, and professional practice.

4. Programme Educational Objectives (PEOs):

- Develop successful professional careers in civil engineering and allied fields.
- Promote entrepreneurship and innovation for employment generation and sustainable development.
- Engage in lifelong learning, research, and professional development.

5. Programme Outcomes (POs): - As per NEC

PO-1 **Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in Knowledge and Attitude Profiles (KA1 to KA4) respectively to develop solutions to complex engineering problems.

PO-2 **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development (KA1 to KA4).

PO-3 **Design/development of solutions:** Design creative solutions for complex engineering problems and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole- life cost, net zero carbon as well as resources, cultural, societal, and environmental considerations as required (KA5)

PO-4 **Investigation:** Conduct investigations of complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (KA8). Complex engineering problems are referred to as the problems:

- that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline as against problems given at the end of chapters in a typical textbook that can be solved using simple engineering theories and techniques;
- that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions;
- that require consideration of appropriate constraints / requirements not explicitly given in the problem statement such as cost, power requirement, durability, product life, etc.;
- which need to be defined (modelled) within appropriate mathematical framework; and
- that often require use of modern computational concepts and tools, for example, in the design of an earthquake resistant building.

PO-5 **Modern Tool Usage:** Create, select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering problems (KA2 and KA6)

PO-6 **The Engineer and the Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices (KA7).

PO-7 **Ethics:** Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (KA9)

PO-8 **Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multidisciplinary, face- to-face, remote and distributed settings (KA9)

PO-9 **Communication:** Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, making effective presentations, taking into account cultural, language, and learning differences.

PO-10 **Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO-11 **Lifelong learning:** Recognize the need for, and have the preparation and ability for:

- independent and life-long learning,
- adaptability to new and emerging technologies, and

- critical thinking in the broadest context of technological change (KA8)

Knowledge and Attitude Profiles (KAs)

KA-1 **Natural and social science:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

KA-2 **Mathematics:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

KA-3 **Engineering fundamentals:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

KA-4 **Specialist knowledge:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

KA-5 **Engineering design & operations:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

KA-6 **Engineering practice:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

KA-7 **Role of Engineering in society:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

KA-8 **Research literature:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

KA-9 **Ethics and conduct:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Specific Outcomes (PSOs):

PSO-1 **Hydro Power Infrastructures: Analysis and design** hydropower infrastructures using modern computational tools such as GIS, Remote Sensing, Numerical Modeling (e.g., HEC-HMS, HEC-RAS, SWAT, PYTHON)

PSO-2 Assess the environmental impact of civil engineering infrastructure on land, water and ecology and incorporate nature-based and low carbon solutions into infrastructure design appropriate to ecological sensitivity.

7. Total Programme Structure with Teaching and Examination Scheme (Semester Wise):

1.	**Title of UG Engg./ Tech. Programme**	:	Bachelor in Civil Engineering
2.	**Duration of Programme**	:	Four Years
3.	**Entry Qualification**	:	+2 and Diploma Passed in Second Division
4.	**Total Marks**	:	
5.	**Total Credits**	:	155
6.	**Total Number of Courses**	:	53
7.	**Qualification Awarded**		B.E.
	BE/ B.Tech.	:	Credits

8. Summary of Credits and Marks:

Year	Semester	Credits	Total Marks
Year -1	Semester -I	21	800
	Semester - II	20	800
Total		**41**	**1600**
Year -2	Semester -III	21	700
	Semester - IV	20	700
Total		**41**	**1400**
Year -3	Semester -V	19	700
	Semester- VI	21	700
Total		**40**	**1400**
Year -4	Semester -VII	21	700
	Semester - VIII	12	200
Total		**33**	**900**
Grand Total		**155**	**5300**

8. Suggested Category wise Courses:

S. No.	Course Category	Abbreviations	Number of Courses	Total Credits
1.	Applied Science Courses	ASC	3	8
2.	Engineering Science Courses	ESC	6	18
3.	Programme Core Courses	PCC	27	81
4.	Programme Elective Courses	PEC	2	6
5.	Open Electives Courses	OEC		
6.	Humanities, Social Science and Management Courses	HSC	4	12
7.	Project, Internship and Industrial Training	PI	5	19
Total				

UG Engg. /Tech. Programme in ……. Semester - I

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	MATH 101	ASC	Calculus and Linear Algebra	3	2	1	-	45	25	75	-	-	100
	PHYS 101	ASC	General Physics I	3	2	-	1	45	25	55	-	20	100
	CHEM 101	ASC	General Chemistry	3	2	-	1	45	25	75	-	-	100
	COMP 102	ESC	Computer Programming	3	2	1	-	45	50	50	-	-	100
	ENGG 111	ESC	Elements of Engineering I	3	2	1	-	45	25	75	-	-	100
	ENGT 101	HSC	Communication Skills I	2	1	1	-	30	50	50	-	-	100
	ENGG 101	PI	Engineering Project Preparation	2	-	-	2	30	100	-	-	-	100
	EDRG 101	ESC	Engineering Drawing I	2	2	1	-	45	60	40	-	-	100
				18									800

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - II**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	MATH104	ASC	Advance Calculus	3	2	1	-	45	25	75	-	-	100
	PHYS 102	ASC	General Physics II	3	2	-	1	45	25	55	20	-	100
	COMP 116	ESC	Object Oriented Programming	3	2	1	-	45	50	50	-	-	100
	ENGG 112	ESC	Elements of Engineering II	3	2	1	-	45	25	75	-	-	100
	ENGT 105	HSC	Technical Communication	3	2	1	-	45	50	50	-	-	100
	ENVE 101	ESC	Introduction to Environmental Engineering	2	2	-	-	30	50	50	-	-	100
	EDRG 102	ESC	Engineering Drawing II	2	1	-	1	45	60	40	-	-	100
	ENGG 102	PI	Engineering Project	2	-	-	2	30	100	-	-	-	100
				21									800

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in …… **Semester - III**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	MATH 207	ASC	Differential Equations & Complex Variables	4	3	1	-	60	25	75	-	-	100
	MATH 205	ASC	Trigonometry & Analytical Geometry	3	2	1	-	45	25	75	-	-	100
	CIEG 201	PCC	Construction Material and Concrete Technology	3	2	1	-	45	50	50	-	-	100
	CIEG 202	PCC	Engineering Survey I	3	2	1	-	45	50	50	-	-	100
	CIEG 203	PCC	Applied Mechanics	3	2	1	-	45	50	50	-	-	100
	CIEG 204	PCC	Fluid Mechanics	3	2	1	-	45	50	50	-	-	100
	CIEG 205	PI	Engineering Project III	2	-	-	2	30	100	-	-	-	100
				21									700

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - IV**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	MCSC 202	ESC	Numerical Methods	3	2	1	-	45	25	75	-	-	100
	MATH 208	ASC	Statistics and Probability	3	2	1	-	45	25	75	-	-	100
	CIEG 206	PCC	Engineering Hydrology and Sedimentology	3	2	1	-	45	50	50	-	-	100
	CIEG 207	PCC	Engineering Survey II	3	2	1	-	45	50	50	-	-	100
	CIEG 208	PCC	Strength of Materials	3	2	1	-	45	50	50	-	-	100
	CIEG 209	ESC	Engineering Geology	3	2	1	-	45	50	50	-	-	100
	CIEG 210	PI	Engineering Project IV	2	-	-	2	30	100	-	-	-	100
				20									700

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - V**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CIEG 301	PCC	Hydraulics and River Engineering	3	2	1	-	45	50	50	-	-	100
	CIEG 302	ESC	Remote Sensing and GIS	2	2	-	-	45	50	50	-	-	100
	CIEG 303	PCC	Soil and Rock Mechanics	3	2	1	-	45-	50	50	-	-	100
	CIEG 304	PCC	Hydraulic Structure	3	2	1	-	45	50	50	-	-	100
	CIEG 305	PCC	Structural Analysis I	3	2	1	-	45-	50	50	-	-	100
	CIEG 306	PCC	Estimating and Valuation	2	1	1	-	45	50	50	-	-	100
	MGTS 301	HSC	Economics	3	2	1	-	45	50	50	-	-	100
				19									700

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in …….. Semester - VI

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CIEG 308	PCC	Structural Analysis II	3	2	1	-	45	50	50	-	-	100
	CIEG 309	PCC	Foundation Engineering	3	2	1	-	45	50	50	-	-	100
	CIEG 310	PCC	Reinforced Concrete Structure Design	3	2	1	-	45	50	50	-	-	100
	CIEG 312	PCC	Electrical Power System Engineering	3	2	1	-	45	50	50	-	-	100
	CIEG 313	PCC	Water Supply & Sanitation	3	2	1	-	45	50	50	-	-	100
	CIEG 314	PCC	Hydraulic Machines	3	2	1	-	45	50	50	-	-	100
	CIEG 307	PI	Engineering Project V (Hydropower Engineering I)	3	1.5	-	1.5	45	50	50	-	-	100
				21									700

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - VII**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CIEG 401	PCC	Transportation Engineering	3	2	1	-	45	50	50	-	-	100
	CIEG 402	PCC	Steel and Timber Structure	3	2	1	-	45	50	50	-	-	100
	CIEG 403	PCC	Construction Management	3	2	1	-	45	50	50	-	-	100
	CIEG 404	PCC	Environment and Social Engineering	3	2	1	-	45	50	50	-	-	100
	CIEG 405	HSC	Entrepreneurship and Ethics	3	2	1	-	45	50	50	-	-	100
	CIEG 406	PCC	Hydropower Engineering II	3	2	1	-	45	50	50	-	-	100
	CIEG 407	PCC	Irrigation Engineering	3	1.5	-	1.5	45	50	50	-	-	100
				21									700

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - VIII**

Department Course Committee	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CIEG 449	PI	Internship	3	-	-	3	45	-	-	30	70	100
	CIEG 499	PI	Final Engineering Project	12	-	-	12	45	-	-	30	70	100
				15									200

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Task – 2

Title – Design & Development of Programme Structure with Teaching & Examination Scheme for the Identified Programme

Name of the University – MANMOHAN TECHNICAL UNIVERSITY

Programme Title – BACHELOR IN CIVIL ENGINEERING

1. **Introduction:** Manmohan Technical University (MTU), School of Engineering is offering this course to produce high level technical manpower capable to undertake the works in the field of Civil Engineering. This curriculum is designed with the purpose of producing high level technical manpower equipped with knowledge and skills related to the field of Civil Engineering to meet national and international demand for economic and infrastructure development. The knowledge and skills incorporated in this curriculum will be helpful to deliver the individual, national and international needs in the field of Civil Engineering.

2. **Vision & Mission Statements of the University:**
   - **Vision:** A technical university committed to excellence in education, research and innovation for contributing to the national and global TE arena.
   - **Mission:** MTU shall become a model technical university recognized for quality education, impactful research and entrepreneurship development.

3. **Vision & Mission Statements of the Department:**
   - **Vision:** Social Transformation through technical education and innovation.
   - **Mission:** To impart entrepreneurial oriented technical education for the sustainable development through innovative as well as indigenous techniques

4. **Programme Educational Objectives (PEOs):**

   At the end of completion of the program, the students would
   - Use technical and analytical skills and undertake works in civil engineering field, as a Civil Engineer, under Road, Irrigation, Water supply, Urban Development and Building Construction and other civil infrastructures development related departments and sectors.
   - Undertake the role of Civil engineer as prescribed by the Public Service Commission of Nepal in Public service sector, private sector, or conduct own business whilst registration with the related Council in the grade as provisioned in the related Council Act.
   - Pursue research and higher education in developing creative solutions to civil engineering problems.

5. **Programme Outcomes (POs): - As per NEC**

PO-1 **Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in Knowledge and Attitude Profiles (KA1 to KA4) respectively to develop solutions to complex engineering problems.

PO-2 **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development (KA1 to KA4).

PO-3 **Design/development of solutions:** Design creative solutions for complex engineering problems and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole- life cost, net zero carbon as well as resources, cultural, societal, and environmental considerations as required (KA5)

PO-4 **Investigation:** Conduct investigations of complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (KA8). Complex engineering problems are referred to as the problems:

- that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline as against problems given at the end of chapters in a typical textbook that can be solved using simple engineering theories and techniques;
- that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions;
- that require consideration of appropriate constraints / requirements not explicitly given in the problem statement such as cost, power requirement, durability, product life, etc.;
- which need to be defined (modelled) within appropriate mathematical framework; and
- that often require use of modern computational concepts and tools, for example, in the design of an earthquake resistant building.

PO-5 **Modern Tool Usage:** Create, select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering problems (KA2 and KA6)

PO-6 **The Engineer and the Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices (KA7).

PO-7 **Ethics:** Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (KA9)

PO-8 **Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multidisciplinary, face- to-face, remote and distributed settings (KA9)

PO-9 **Communication:** Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, making effective presentations, taking into account cultural, language, and learning differences.

PO-10 Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO-11 Lifelong learning: Recognize the need for, and have the preparation and ability for:

- independent and life-long learning,
- adaptability to new and emerging technologies, and
- critical thinking in the broadest context of technological change (KA8)

Knowledge and Attitude Profiles (KAs)

KA-1 Natural and social science: A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

KA-2 Mathematics: Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

KA-3 Engineering fundamentals: A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

KA-4 Specialist knowledge: Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

KA-5 Engineering design & operations: Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

KA-6 Engineering practice: Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

KA-7 Role of Engineering in society: Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

KA-8 Research literature: Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

KA-9 Ethics and conduct: Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Specific Outcomes (PSOs):

PSO-1 To apply knowledge of engineering principles in the design of structures by systematically identifying and solving the geotechnical, structural, and socio-environmental issues using state of the art technologies and scientific methods.

PSO-2 To assess societal, health, safety, legal and cultural issues and the consequent responsibilities and provide creative and efficient solution acceptable to the society, promoting use of local resources and developing subsequent standards whilst adhering to national/international laws/norms.

7. Total Programme Structure with Teaching and Examination Scheme (Semester Wise):

1.	**Title of UG Engg./ Tech. Programme**	:	BE in Civil Engineering
2.	**Duration of Programme**	:	Four Years
3.	**Entry Qualification**	:	+2, Diploma or equivalent with 50% aggregate with minimum 50% in PCM or 2.00 CGPA with minimum C+ grade in PCM
4.	**Total Marks**	:	
5.	**Total Credits**	:	
6.	**Total Number of Courses**	:	
7.	**Qualification Awarded**		
	BE/ B.Tech.	:	Credits

8. Summary of Credits and Marks:

Year	Semester	Credits	Total Marks
Year -1	Semester -I		
	Semester - II		
Total			
Year -2	Semester -III		
	Semester - IV		
Total			
Year -3	Semester -V		
	Semester- VI		
Total			
Year -4	Semester -VII		
	Semester - VIII		
Total			
Grand Total			

8. Suggested Category wise Courses:

S. No.	Course Category	Abbreviations	Number of Courses	Total Credits
1.	Applied Science Courses	ASC	5	17
2.	Engineering Science Courses	ESC	8	24
3.	Programme Core Courses	PCC	8	31
4.	Programme Elective Courses	PEC	4	6
5.	Open Electives Courses	OEC	2	0
6.	Humanities, Social Science and Management Courses	HSC	8	17

7.	Project, Internship and Industrial Training	PI	6	12
Total			**41**	**107**

UG Engg. /Tech. Programme in ……. **Semester - I**

SEM I													
		ASC	Applied Mathematics I	4	3	4		7	60	40			
		ASC	Chemistry of Materials and environment	3	2	2	2	6	60	40	30	20	
		ASC	Applied Physics and Mechanics	3	2	2	2	6	60	40	30	20	
		ESC	Engineering Graphics Lab	1	0	0	4	4			60	40	
		ESC	Computational Techniques in solving Engineering Problems	3	1	2	4	7			60	40	
		HSC	Culture, Architecture and Society	2	1		2	3	30	20	30	20	
		HSC	Communication Techniques	2	1	2	2	5	30	20	30	20	
			Total	18	10	12	16	38					
SEM II			**SEM II**										
		ASC	Applied Mathematics II	4	3	4		7	60	40			
		ASC	Electrical and Electronics Engineering	3	1	2	4	7	60	40	30	20	
		ESC	Surveying (including Camp)	5	2	2	8	12	30	20	100		
		OEC	Open Elective I	0				0			100		
		HSC	Social Need Assessment	1	0	0	4	4			50		
		ESC	Scientific Methods	2	1	2	2	5	60	40	50		
			Toal	15	7	10	18	35					
SEM III			**SEM III**										
		PCC	Mechanics of Solids	4	3	2	2	7	60	40	30	20	
		HSC	Numerical Analysis and Data Science	4	2	2	4	8	30	20	60	40	
		ESC	Fluid Dynamics and Hydrology	4	3	2	2	7	60	40	30	20	
		ESC	Geotechnical Engineering	3	2	2	2	6	60	40	30	20	
		PI	Minor Project I	1	0	0	4	4			100		
			Total	16	10	8	14	32					
SEM IV			**SEM IV**										
		ESC	Engineering Economics, Estimating and Valuation	3	2	2	2	6	60	40	30	20	
		PCC	Water Resource Engineering	3	2	2	2	6	60	40	30	20	
		PCC	Highway Engineering	4	2	4	2	8	60	40	30	20	
		HSC	Data Analysis and Machine Learning	4	2	4	2	8	60	40	30	20	
		PCC	Analysis of Structures	6	4	4	2	10	60	40	30	20	
			Total	20	12	16	10	38	60	40	30	20	
SEM V			**SEM V**										

		PCC	Finite Element Method	3	2	2	2	6	60	40	30	20	
		PCC	Design of Engineering Structures	4	2	4	2	8	60	40	30	20	
		PI	Minor Project II	1	0	0	4	4	60	40	30	20	
		PEC	Environmental Engineering	6	4	4	4	12	60	40	30	20	
		ESC	AI in Civil Engineering and Smart Cities	3	1	2	4	7	60	40	30	20	
		PI	Exhibition	1	0	0	2	2	60	40	30	20	
			Total	18	9	12	18	39					
SEM VI			**SEM VI**										
		PCC	Holistic Design	3	1		6	7	60	40	30	20	
		PI	Seminar/Conference	1	0	0	2	2	60	40	30	20	
		PCC	Structure Health, Maintenance, Monitoring and Retrofitting	4	2	2	4	8	60	40	30	20	
		HSC	Professional Ethics and Laws	2	1	2	0	3	60	40	30	20	
		PEC	Program Elective I						60	40	30	20	
		OEC	Open Elective II						60	40	30	20	
		PEC	Program Elective II						60	40	30	20	
			Total	10	4	4	12	20					
SEM VII			**SEM VII**										
		PI	Major Project	2	0	0	8	8			200	100	
		HSC	Education Pedagogy (According to National Policy to attract top students academia)	2	1	2	2	5	60	40	30	20	
		PEC	Program Elective III					0	60	40	30	20	
		HSC	Entrepreneurship		1		2	3	60	40	30	20	
			Total	4	2	2	12	16					
SEM VIII			**SEM VIII**										
		PI	Internship	6	-	-	30	30			200		
					0	0	30	30					

Legend:

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Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Task – 2

Title – Design & Development of Programme Structure with Teaching & Examination Scheme for the Identified Programme

Name of the University – Lumbini Technological University

Programme Title – B. Tech in Civil Engineering

1. **Introduction:**

   Civil engineering plays a crucial role in the development, maintenance, and improvement of infrastructure, which is essential for building and maintaining sustainable, resilient, and livable environments for current and future generations. Civil engineering education is essential as it produces professionals who are equipped to design, construct, and maintain infrastructure, ensuring public safety, driving economic growth, promoting sustainability, and enhancing the quality of life. Moreover, with more than half of the world's population already living in cities, urban infrastructure and services are more critical than ever to ensure sustainable development, which highlights the need to incorporate urban engineering components into the traditional civil engineering program. The rise of urbanization and the consequent increase in development projects highlight a substantial need for professionals in civil engineering. The program at LTU follows a well-rounded, comprehensive curriculum that cover the key concepts and skills necessary for success in the field of civil engineering.

2. **Vision & Mission Statements of the University:**

   Vision: To place LTU at global position in university education with domain expertise.

   Mission: To be an institution of excellence in the domain of higher technical education that serves as the fountainhead for nurturing the future leaders of technology and techno-innovation responsible for the techno-economic, social, cultural and environmental prosperity of the people.

3. **Vision & Mission Statements of the Department**

   Vision: To be a center of excellence in civil engineering education and research, producing innovative, ethical, and socially responsible engineers capable of building sustainable infrastructure for a resilient future.

   Mission:

   Academic Excellence: To provide a rigorous, industry-aligned curriculum that integrates fundamental engineering principles with modern technological advancements.

Research & Innovation: To foster a culture of inquiry and problem-solving, focusing on sustainable urban planning, disaster-resilient structures, and green construction materials.

Societal Impact: To contribute to the development of the Lumbini province and beyond by providing technical expertise and lifelong learning opportunities.

Professional Ethics: To instill core values of integrity, leadership, and environmental stewardship in students to meet global challenges.

4. Programme Educational Objectives (PEOs):

Students will be able to do 3 to 5 years after graduation

i. Apply fundamental engineering knowledge and modern technological tools to design, execute, and manage complex civil engineering projects, establishing themselves as competent professionals and entrepreneurs in the global and local industry.

ii. Demonstrate a commitment to sustainable development and disaster-resilient engineering practices, specifically addressing environmental challenges of the Lumbini province and the nation.

iii. Exhibit strong leadership qualities, effective communication skills, and high ethical standards, ensuring that engineering solutions are safe, economical, and socially inclusive.

iv. Engage in continuous professional development through higher studies, research to adapt to the rapidly evolving technological landscape and emerging industry trends

5. Programme Outcomes (POs): - As per NEC

PO-1 **Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in Knowledge and Attitude Profiles (KA1 to KA4) respectively to develop solutions to complex engineering problems.

PO-2 **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development (KA1 to KA4).

PO-3 **Design/development of solutions:** Design creative solutions for complex engineering problems and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole- life cost, net zero carbon as well as resources, cultural, societal, and environmental considerations as required (KA5)

PO-4 **Investigation:** Conduct investigations of complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (KA8). Complex engineering problems are referred to as the problems:

- that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline as against problems given at the end of chapters in a typical textbook that can be solved using simple engineering theories and techniques;
- that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions;
- that require consideration of appropriate constraints / requirements not explicitly given in the problem statement such as cost, power requirement, durability, product life, etc.;
- which need to be defined (modelled) within appropriate mathematical framework; and
- that often require use of modern computational concepts and tools, for example, in the design of an earthquake resistant building.

PO-5 **Modern Tool Usage:** Create, select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering problems (KA2 and KA6)

PO-6 **The Engineer and the Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices (KA7).

PO-7 **Ethics:** Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (KA9)

PO-8 **Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multidisciplinary, face- to-face, remote and distributed settings (KA9)

PO-9 **Communication:** Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, making effective presentations, taking into account cultural, language, and learning differences.

PO-10 **Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO-11 **Lifelong learning:** Recognize the need for, and have the preparation and ability for:

- independent and life-long learning,
- adaptability to new and emerging technologies, and
- critical thinking in the broadest context of technological change (KA8)

Knowledge and Attitude Profiles (KAs)

KA-1 **Natural and social science:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

KA-2 **Mathematics:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

KA-3 **Engineering fundamentals:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

KA-4 **Specialist knowledge:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

KA-5 **Engineering design & operations:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

KA-6 **Engineering practice:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

KA-7 **Role of Engineering in society:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

KA-8 **Research literature:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

KA-9 **Ethics and conduct:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Specific Outcomes (PSOs):

PSO-1 Digital integration Construction and Management

Utilize advanced software tools and modern methodologies such as Building Information Modeling (BIM), GIS, and specialized structural analysis suites to plan, estimate, and manage infrastructure projects with high precision and efficiency.

PSO-2 Sustainable Infrastructure Development

Implement environmentally sustainable construction practices and water resource management techniques that prioritize local materials, energy efficiency, and the preservation of regional ecological integrity.

7. Total Programme Structure with Teaching and Examination Scheme (Semester Wise):

1. **Title of UG Engg./ Tech. Programme** : B. Tech in Civil Engineering
2. **Duration of Programme** : Four Years
3. **Entry Qualification** : +2 Science/Diploma
4. **Total Marks** : 4950
5. **Total Credits** : 144
6. **Total Number of Courses** : 50
7. **Qualification Awarded** B. Tech in Civil Engineering
   BE/ B.Tech. : 144 Credits

8. Summary of Credits and Marks:

Year	Semester	Credits	Total Marks
Year -1	Semester -I	15	600
	Semester - II	15	600
Total		**30**	**1200**
Year -2	Semester -III	16	575
	Semester - IV	20	675
Total		36	1250
Year -3	Semester -V	19	600
	Semester- VI	19	700
Total		38	1300
Year -4	Semester -VII	20	700
	Semester - VIII	20	500
Total		40	1200
Grand Total		**144**	4950

8. Suggested Category wise Courses:

S. No.	Course Category	Abbreviations	Number of Courses	Total Credits
1.	Applied Science Courses	ASC	8	23
2.	Engineering Science Courses	ESC	18	48
3.	Programme Core Courses	PCC	14	40
4.	Programme Elective Courses	PEC	2	6
5.	Open Electives Courses	OEC	1	3
6.	Humanities, Social Science and Management Courses	HSC	4	8
7.	Project, Internship and Industrial Training	PI	3	16
Total			**50**	**144**

UG Engg. /Tech. Programme in ……. **Semester - I**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	BCE 101	ASC	**Engineering Mathematics I**	**3**	**3**	**2**	**0**	**80**	**60**	**40**	**0**	**0**	**100**
	BCE 102	ASC	**Engineering Physics**	**3**	**3**	**1**	**2**	**96**	**40**	**40**	**20**	**0**	**100**
	BCE 103	ASC	**Engineering Chemistry**	**3**	**3**	**1**	**2**	**96**	**40**	**40**	**20**	**0**	**100**
	BCE 104	ESC	**Basic programming for engineering application**	**3**	**3**	**1**	**2**	**96**	**40**	**40**	**20**	**0**	**100**
	BCE 105	ESC	**Engineering Drawing**	**2**	**2**	**1**	**3**	**96**	**40**	**40**	**20**	**0**	**100**
	BCE 106	HSC	**Technical English Communication**	**1**	**1**	**2**	**0**	**48**	**60**	**40**	**0**	**0**	**100**
		NEPC	**Happiness and Meditation**										

Legend:

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Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - II**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	BCE 150	ASC	Engineering Mathematics II	3	3	2	0	80	60	40	0	0	100
	BCE 151	ESC	Engineering Mechanics	3	3	2	0	48	60	40	0	0	100
	BCE 152	ESC	Civil Engineering Materials	2	2	1	1	96	40	40	20	0	100
	BCE 153	ESC	Python programming for civil engineering application	3	3	1	2	96	40	40	20	0	100
	BCE 154	ESC	Workshop Technology	1	1	1	3	80	40	40	20	0	100
	BCE 155	ESC	Basic Electrical and Electronics Engineering	3	3	1	1	80	40	40	20	0	100
	BCE 156		Engineering Geology										

Legend:

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Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in …… **Semester - III**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	BCE 201	ASC	Engineering Mathematics III	3	3	2	0	80	60	40	0	0	100
	BCE 202	ESC	Environmental & Social Impact Assessment	2	2	1	0	48	60	40	0	0	100
	BCE 203	PCC	Building Technology and Drawing	3	3	1	2	96	40	40	20	0	100
	BCE 204	PCC	Strength of Materials	3	3	2	1	96	40	40	20	0	100
	BCE 205	ESC	Fluid Mechanics	3	3	1	1	80	40	40	20	0	100
	BCE 206	ASC	Project I	2	2	1	2	80	10	40	25	0	75
			Numerical methods	16									

Legend:

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Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - IV**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	BCE 250	ASC	Theory of Structures I	3	3	1	1	80	40	40	20	0	100
	BCE 251	ASC	Probability and Statistics	3	3	1	0	64	60	40	0	0	100
	BCE 252	ESC	Soil Mechanics	3	3	1	1	80	40	40	20	0	100
	BCE 253	ESC	Engineering Hydrology	3	3	1	1	80	40	40	20	0	100
	BCE 254	ESC	Hydraulics	3	3	1	1	80	40	40	20	0	100
	BCE 255	ESC		2	2	1	2	80	10	40	25	0	75
	BCE 256	ESC	Surveying and Geospatial	3	3	1	3	112	40	40	20	0	100
				20									

Legend:

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Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - V**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	BCE 301	PCC	Entrepreneurship Development	3	3	2	1	96	40	40	20	0	100
	BCE 302	ESC	Water Supply Engineering	3	3	1	1	80	40	40	20	0	100
	BCE 303	PCC	Transportation Engineering I	3	3	2	1	96	40	40	20	0	100
	BCE 304	ESC	Foundation Engineering	3	3	2	1	96	40	40	20	0	100
	BCE 305	ESC	Surveying II	3	3	1	3	112	40	40	20	0	100
	BCE 306	PI	Survey Camp (10 Days)	4				60	0	0	60	40	100
			Ethical Governance and Moral Intuition	19									
			Theory of Structures II										

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Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in …….. **Semester - VI**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	BCE 351	PCC		3	3	2	1	96	40	40	20	0	100
	BCE 352	ESC	Sanitary Engineering	3	3	1	1	80	40	40	20	0	100
	BCE 353	PCC	Transportation Engineering II	3	3	1	1	80	40	40	20	0	100
	BCE 354	PCC	Design of Steel and Timber Structures	3	3	2	0	80	60	40	0	0	100
	BCE 355	PCC	Irrigation and Drainage Engineering	3	3	2	0	80	60	40	0	0	100
	BCE 356	PCC	Masonry Structures and Structural Rehabilitation	2	2	1	1	64	40	40	20	0	100
	BCE 356	PCC	Sustainable Construction and Concrete Technology	2	2	1	1	64	40	40	20	0	100
				19									

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Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - VII**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	BCE 401	PI	Research Methodology	2	2	1	0	48	60	40	0	0	100
	BCE 402	PCC	Urban Planning	3	3	1	0	64	60	40	0	0	100
	BCE 403	PCC	Design of Reinforced Concrete Structures	3	3	2	1	96	40	40	20	0	100
	BCE 404	PCC	Sustainable Hydropower Engineering	3	3	2	1	96	40	40	20	0	100
	BCE 405	PCC	Estimating, Costing and Valuation	3	3	2	0	80	60	40	0	0	100
	BCE 430	OEC	Elective I (Common)	3	3	2	0	80	60	40	0	0	100
	BCE 440	PEC	Elective II (Stream)	3	3	2	0	80	60	40	0	0	100
				20									

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Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - VIII**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	BCE 450	HSC	Engineering Economics	3	3	1	0	64	60	40	0	0	100
	BCE 451	HSC	Construction Project Management	3	3	1	0	64	60	40	0	0	100
	BCE 452	HSC	Professional Practice and Ethics	1	1	1	0	32	60	40	0	0	100
	BCE 460	PEC	Elective II (Stream)	3	3	2	0	80	60	40	0	0	100
	BCE 480	PI	Capstone Project (Internship-Based)	10				160					100
				20									

Legend:

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Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Elective Stream	Elective Common
Tunnel Engineering	Happiness
GIS	Life Transformation Skill
Earthquake Registering Building	Ideas and Innovation In Manufacture
Public Health Engineering	Code and Standard for Civil Engineering

Task – 2

Title – Design & Development of Programme Structure with Teaching & Examination Scheme for the Identified Programme

Name of the University – Far- Western University

Programme Title - BE Civil Engineering

1. Introduction:

The Far Western University (FWU) is offering the course in Bachelor's Degree in Civil Engineering. The objective of this course is to produce the Civil Engineers of quality standard to serve in the development activities of the nation.

2. Vision & Mission Statements of the University:

To gain recognition as a prime university committed to providing quality education, and enhancing research and innovation to meet the needs of society.

To provide professional and scholarly environment by developing institutional structures and mechanisms that enable faculty, students and staff, devising academic programs that contribute towards the advancement of knowledge and thereby cultivating active citizenship through teaching, research, collaboration and community engagement. CORE VALUES AND PRINCIPLES Academic excellence: To provide the best possible education considering all aspects of students' academic development by adopting dynamic teaching-learning environment Lifelong learning: To develop and impart positive attitude through continuous learning to act cautiously even in adverse situation Accountability: To encourage sense of responsibility on the processes and outcomes of every action Sustainability: To consider sustainability in all aspects of its operations including research and education Integrity: To develop the culture of trust, honesty and fairness in all actions and words Respect: To foster the culture of accepting differences in community cultures, values, beliefs and respecting individual rights and diversity while promoting humanity, unwavering exploration of novelty and unconditional commitment to truth and knowledge. GOALS • To provide quality education and equip students with knowledge, skills, positive attitude and values, • to create opportunities and support for research by enhancing the public engagement, and • to ensure the financial and environmental sustainability of the University.

3. Vision & Mission Statements of the Department

To become a center of excellence in engineering education and research and produce globally competent professional minds upholding human values and ethics to serve the society by taking part in industrial, scientific innovation, academic and entrepreneurship activities within the country and abroad.

To provide students the innovative and entrepreneurial skills to meet the need of the industry and society, and make them able to compete successfully in a global economy.

4. Programme Educational Objectives (PEOs): 2-5

PEO 1: Professional Competence

Apply strong foundations in mathematics, science, and engineering to solve complex civil and environmental problems.

PEO 2: Career Development

Establish successful careers in civil engineering practice, higher education, research, or entrepreneurship.

PEO 3: Leadership & Communication

Demonstrate leadership, teamwork, and effective communication in multidisciplinary and multicultural environments.

PEO 4: Ethics & Social Responsibility

Practice engineering with ethical responsibility, considering environmental, societal, and economic impacts.

PEO 5: Lifelong Learning

Engage in continuous learning, professional development, and adaptation to emerging technologies and challenges.

5. Programme Outcomes (POs): - As per NEC

PO-1 **Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in Knowledge and Attitude Profiles (KA1 to KA4) respectively to develop solutions to complex engineering problems.

PO-2 **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development (KA1 to KA4).

PO-3 **Design/development of solutions:** Design creative solutions for complex engineering problems and design systems, components or processes to meet identified needs with appropriate consideration for public health and safety, whole- life cost, net zero carbon as well as resources, cultural, societal, and environmental considerations as required (KA5)

PO-4 **Investigation:** Conduct investigations of complex engineering problems using research methods including research-based knowledge, design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions (KA8). Complex engineering problems are referred to as the problems:

- that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline as against problems given at the end of chapters in a typical textbook that can be solved using simple engineering theories and techniques;
- that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions;

- that require consideration of appropriate constraints / requirements not explicitly given in the problem statement such as cost, power requirement, durability, product life, etc.;
- which need to be defined (modelled) within appropriate mathematical framework; and
- that often require use of modern computational concepts and tools, for example, in the design of an earthquake resistant building.

PO-5 **Modern Tool Usage:** Create, select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex engineering problems (KA2 and KA6)

PO-6 **The Engineer and the Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices (KA7).

PO-7 **Ethics:** Apply ethical principles and commit to professional ethics and norms of engineering practice and adhere to relevant national and international laws. Demonstrate an understanding of the need for diversity and inclusion (KA9)

PO-8 **Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse and inclusive teams and in multidisciplinary, face- to-face, remote and distributed settings (KA9)

PO-9 **Communication:** Communicate effectively and inclusively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, making effective presentations, taking into account cultural, language, and learning differences.

PO-10 **Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO-11 **Lifelong learning:** Recognize the need for, and have the preparation and ability for:

- independent and life-long learning,
- adaptability to new and emerging technologies, and
- critical thinking in the broadest context of technological change (KA8)

Knowledge and Attitude Profiles (KAs)

KA-1 **Natural and social science:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

KA-2 **Mathematics:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

KA-3 **Engineering fundamentals:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

KA-4 **Specialist knowledge:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

KA-5 **Engineering design & operations:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

KA-6 **Engineering practice:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

KA-7 **Role of Engineering in society:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

KA-8 **Research literature:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

KA-9 **Ethics and conduct:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

6. Programme Specific Outcomes (PSOs):

PSO-1 Ability to use building software packages to calculate safe loads and stresses for designing structural members to ensure safety and serviceability.

PSO 2: Ability to provide innovative solutions for traffic safety and efficiency through intelligent transportation systems, and mitigate the environmental impact of construction by adopting green building concepts.

7. Total Programme Structure with Teaching and Examination Scheme (Semester Wise):

1.	**Title of UG Engg./ Tech. Programme**	:	Civil Engineering
2.	**Duration of Programme**	:	Four Years
3.	**Entry Qualification**	:	Intermediate level complete with 40 % entrance scour
4.	**Total Marks**	:	
5.	**Total Credits**	:	154
6.	**Total Number of Courses**	:	52
7.	**Qualification Awarded BE/ B.Tech.**	:	Credits

8. Summary of Credits and Marks:

Year	Semester	Credits	Total Marks
Year -1	Semester -I	17	700
	Semester - II	20	825
Total		**37**	**1525**
Year -2	Semester -III	20	850
	Semester - IV	21	700
Total		**41**	**1550**
Year -3	Semester -V	21	850
	Semester- VI	22	800
Total		**43**	**1650**
Year -4	Semester -VII	20	750
	Semester - VIII	13	300
Total		**33**	**1050**
Grand Total		**154**	**5775**

8. Suggested Category wise Courses:

S. No.	Course Category	Abbreviations	Number of Courses	Total Credits
1.	Applied Science Courses	ASC	7	21
2.	Engineering Science Courses	ESC	9	21
3.	Programme Core Courses	PCC	25	82
4.	Programme Elective Courses	PEC	3	9
5.	Open Electives Courses	OEC	0	0
6.	Humanities, Social Science and Management Courses	HSC	3	9
7.	Project, Internship and Industrial Training	PI	3	12
Total			**50**	**154**

UG Engg. /Tech. Programme in ……. **Semester - I**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	SH1101	ASC	Engineering Mathematics I	3	3	1	0	4	40	60	0	0	100
	SH1102	ASC	Engineering Physics	3	3	1	1.5	5.5	40	60	10	15	125
	EL1103	ESC	Basic Electrical and Electronics	3	3	1	1.5	5.5	40	60	10	15	125
	CE1104	ESC	Applied Mechanics	3	3	2	0	5	40	60	0	0	100
	CT1105	ESC	Computer Programming	3	3	1	2	6	40	60	20	30	150
	AR1106	ESC	Engineering Drawing	2	1		2	3			40	60	100

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - II**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		ASC	Engineering Mathematics II	3	3	1	0	4	40	60	0	0	100
		ASC	Engineering Chemistry	3	3	1	1	5.5	40	60	10	15	125
		PCC	Strength of Material	4	4	1	1	6	40	60	10	15	125
		PCC	Construction Materials	3	3	0	1.5	4.5	40	60	10	15	125
		PCC	Building Technology	3	3	1	0	4	40	60	0	0	100
		ESC	Basic Civil Engineering Workshop	1	1	0	1.5	2.5	0	0	40	60	100
		PCC	Engineering Survey I	3	3	1	3	7	40	60	20	30	150

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in …… Semester - III

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		ASC	Engineering Mathematics III	3	3	1	0	4	40	60	0	0	100
		PCC	Structural Analysis I	4	4	1	1	6	40	60	10	15	125
		ESC	Computer Aided Drawing	1	0	0	2	2	0	0	40	60	100
		PCC	Fluid mechanics	4	4	1	1	6	40	60	10	15	125
		PCC	Concrete Technology	2	2	1	1.5	4.5	40	60	10	15	125
		PCC	Engineering Survey II	3	3	1	3	7	40	60	20	30	150
		ASC	Engineering Geology	3	3	1	1	5	40	60	10	15	125

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - IV**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		ASC	Probability and Statistics	3	3	1	0	4	40	60	0	0	100
		ESC	Numerical Methods	3	3	1	1.5	5.5	40	60	10	15	125
		PCC	Structural Analysis II	4	4	1	1	6	40	60	10	15	125
		PCC	Geotechnical Engineering I	4	4	1	1.5	6.5	40	60	10	15	125
		HSC	Engineering Economics	3	3	1	0	4	40	60	0	0	100
		PCC	Hydraulics	4	4	1	1	6	40	60	10	15	125

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - V**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		PCC	Design of steel structures	3	3	2	1	6	40	60	10	15	125
		PCC	Geotechnical Engineering I	4	4	1	1	6	40	60	10	15	125
		PCC	Transpiration Engineering II	3	3	2	1.5	6.5	40	60	10	15	125
		PCC	Design of Masonry and timber structures	3	3	1	1	6	40	60	10	15	125
		PCC	Water supply engineering	3	3	1	1	5	40	60	10	15	125
		PCC	Engineering Hydrology	3	3	1	1	5	40	60	10	15	125
		PI	Survey Camp	2			2	2			40	60	100

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in …….. Semester - VI

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		PCC	Design of Reinforced concrete structure	4	4	1	1,5	6.5	40	60	10	15	125
		HSC	Technical Communication	3	3	0	1	4	40	60	10	15	125
		PCC	Sanitary Engineering	3	3	1	1	5	40	60	10	15	125
		PCC	Water Resource Engineering-I	3	3	2	0	5	40	60	0	0	100
		PCC	Transpiration Engineering II	3	3	1	1	5	40	60	10	15	125
		PCC	Estimation and Valuation	3	3	2	0	5	40	60	0	0	100
		PEC	Elective -I	3	3	1	0	4	40	60	0	0	100

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - VII**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		PCC	Construction Project Management	3	3	1	0	4	40	60	0	0	100
		PCC	Water Resource Engineering-I	3	3	2	1	6	40	60	10	15	125
		PCC	Sustainability for Civil Engineering	3	3	1	0	4	40	60	0	0	100
		ESC	Remote Sensing & GIS	3	3	0	1.5	4.5	40	60	10	15	125
		PEC	Elective-II	3	3	1	0	4	40	60	0	0	100
		PEC	Elective-II	3	3	1	0	4	40	60	0	0	100
		PI	Project-I	2							40	60	100

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

UG Engg. /Tech. Programme in ……. **Semester - VIII**

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		HSC	Engineering Professional Practice and Society	3	3	1		4	40	60			100
		PI	Project-II	4							40	60	100
		PI	Internship	6					40	60			100

Legend:

L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical

Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

Open Electives	
1. Advanced Excel	7. Civil Engineering Software
2. Low volume Road	8. Life Transformation Skill
3. Earthquake Resisting Building Design	9. Ideas and Innovation in manufacturing
4. Structural Adit and Retrofitting	
5. Public Health Engineering	
6. Human resource and Financial Management	

Task – 2

Design & Development of Programme Structure with Teaching & Examination Scheme for the Identified Programme

Name of the University

Mid-West University (MWU), Nepal

Programme Title

Bachelor of Civil Engineering (BE Civil)

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1. Introduction

The Bachelor of Civil Engineering (BE Civil) program of Mid-West University is a four-year undergraduate engineering program designed to produce technically competent, socially responsible, and professionally skilled civil engineers capable of addressing the infrastructure development needs of Nepal. The curriculum has been redesigned and revised to align with modern engineering education practices, Nepal Engineering Council (NEC) requirements, Outcome-Based Education (OBE), sustainability principles, and industry needs.

The revised curriculum emphasizes:

- Strong theoretical foundation
- Practical and laboratory-based learning
- Design-oriented education
- Software and digital tool integration
- Sustainable infrastructure development
- Project-based learning
- Professional ethics and communication
- Field exposure and internship

The program integrates modern civil engineering domains including structural engineering, transportation engineering, geotechnical engineering, water resources engineering, environmental engineering, hydropower engineering, and construction management.

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2. Vision & Mission Statements of the University

Vision

To become a leading academic institution producing competent human resources through quality education, innovation, research, and community engagement for national and global development.

Mission

- Provide quality higher education in engineering and technology.
- Produce skilled and ethical graduates for professional practice.
- Promote research, innovation, and entrepreneurship.
- Address regional and national development challenges.
- Develop sustainable and socially responsible engineering solutions.

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3. Vision & Mission Statements of the Department

Vision

To establish the Civil Engineering program as a center of excellence in engineering education, research, innovation, and sustainable infrastructure development.

Mission

- Deliver quality engineering education with practical orientation.
- Develop technically competent and professionally responsible civil engineers.
- Integrate modern tools, sustainability, and innovation into engineering practice.
- Promote research, field exposure, and industry collaboration.
- Enhance leadership, communication, and lifelong learning skills.

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4. Programme Educational Objectives (PEOs)

After graduation, BE Civil graduates are expected to:

PEO-1

Apply engineering fundamentals, mathematics, and civil engineering principles to solve real-world infrastructure problems.

PEO-2

Design, analyze, construct, and manage sustainable civil engineering projects using modern engineering tools and technologies.

PEO-3

Demonstrate professional ethics, communication skills, teamwork, leadership, and social responsibility in engineering practice.

PEO-4

Engage in lifelong learning, research, innovation, and professional development to adapt to emerging engineering technologies.

PEO-5

Contribute to national development through sustainable infrastructure planning, environmental protection, and disaster-resilient engineering solutions.

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5. Programme Outcomes (POs)

The BE Civil Engineering graduates will attain the following Programme Outcomes in accordance with Nepal Engineering Council (NEC) requirements:

PO-1 Engineering Knowledge

Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization to solve complex civil engineering problems.

PO-2 Problem Analysis

Identify, formulate, analyze, and solve complex engineering problems using scientific and engineering principles.

PO-3 Design/Development of Solutions

Design sustainable and economical engineering systems, structures, and processes considering safety, environmental, and societal needs.

PO-4 Investigation

Conduct experiments, investigations, data analysis, and research-based studies for engineering applications.

PO-5 Modern Tool Usage

Use modern engineering tools, software, modeling, simulation, and IT applications for engineering analysis and design.

PO-6 The Engineer and Society

Understand social, legal, health, safety, environmental, and cultural responsibilities relevant to civil engineering practice.

PO-7 Ethics

Apply professional ethics, engineering standards, and codes of conduct in professional practice.

PO-8 Individual and Team Work

Work effectively as an individual and as a member or leader in multidisciplinary teams.

PO-9 Communication

Communicate effectively through technical reports, presentations, drawings, and professional documentation.

PO-10 Project Management and Finance

Apply engineering management, estimation, scheduling, procurement, and financial principles in projects.

PO-11 Lifelong Learning

Recognize the need for continuous learning, adaptability, and professional development.

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6. Programme Specific Outcomes (PSOs)

PSO-1

Apply civil engineering principles and modern software tools for planning, analysis, design, construction, and maintenance of infrastructure systems.

PSO-2

Develop sustainable, disaster-resilient, and environmentally responsible infrastructure solutions suitable for Nepal’s geographical and socio-economic conditions.

PSO-3

Demonstrate professional competence in structural, transportation, geotechnical, water resources, hydropower, and environmental engineering through practical and project-based learning.

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7. Total Programme Structure with Teaching and Examination Scheme

Particular	Details
Programme Title	Bachelor of Civil Engineering
Duration	Four Years (8 Semesters)
Entry Qualification	10+2 Science or equivalent with entrance examination
Total Credits	151
Total Marks	5670
Total Number of Courses	56+
Degree Awarded	Bachelor of Civil Engineering
System	Semester Based

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8. Summary of Credits and Marks

Year	Semester	Credits
Year I	Semester I	19
	Semester II	18
Year II	Semester III	17
	Semester IV	23
Year III	Semester V	21
	Semester VI	21
Year IV	Semester VII	22
	Semester VIII	10
	Total	151

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9. Suggested Category Wise Courses

S.N.	Course Category	Abbreviation
1	Applied Science Courses	ASC
2	Engineering Science Courses	ESC
3	Programme Core Courses	PCC
4	Programme Elective Courses	PEC
5	Humanities and Management Courses	HSMC
6	Project and Internship	PI

Semester Wise Teaching and Examination Scheme

Semester I

Course Code	Course Title	Credits
BCESH111	Engineering Mathematics I	3
BCE112	Applied Mechanics I (Statics)	3
BCESH113	Engineering Physics	4
BCEME114	Engineering Drawing I	2
BCEME115	Engineering Workshop Practice	1
BCE116	Civil Engineering Materials	3
BCECO117	Fundamentals of Computer Programming	3
	Total	19

Semester II

Course Code	Course Title	Credits
BCESH121	Engineering Mathematics II	3
BCE122	Applied Mechanics II (Dynamics)	3
BCE123	Building Technology	2
BCESH124	Communication English	2
BCESH125	Engineering Chemistry	3
BCEME126	Engineering Drawing II	2
BCEEE127	Basic Electrical and Electronics Engineering	3

Course Code	Course Title	Credits
	Total	18

Semester III

Course Code	Course Title	Credits
BCESH131	Engineering Mathematics III	3
BCE132	Strength of Materials	3
BCE133	Fluid Mechanics	3
BCE134	Engineering Surveying I	3
BCE135	Engineering Project Work	1
BCE136	Computer Aided Drawing and Drafting	1
BCE137	Engineering Geology	3
	Total	17

Semester IV

Course Code	Course Title	Credits
BCE141	Structural Analysis I	4
BCESH142	Probability and Statistics	3
BCE143	Engineering Surveying II	3
BCE144	Hydraulics	4
BCE145	Soil Mechanics	3
BCE146	Concrete Technology	3
BCECO147	Numerical Analysis and Computing	3
	Total	23

Semester V

Course Code	Course Title	Credits
BCE151	Structural Analysis II	4
BCE152	Survey Field Project	1
BCE153	Water Supply Engineering	3
BCEMS154	Engineering Economics	3

Course Code	Course Title	Credits
BCE155	Foundation Engineering	4
BCE156	Transportation Engineering I	3
BCE157	Engineering Hydrology	3
	Total	21

Semester VI

Course Code	Course Title	Credits
BCE161	Design of Steel Structures	4
BCE162	Transportation Engineering II	3
BCE163	Irrigation Engineering	3
BCE164	Sanitary Engineering	3
BCE165	Engineering Professional Practices	2
BCE166	Design of Timber and Masonry Structures	3
BCE167	Elective I	3
	Total	21

Semester VII

Course Code	Course Title	Credits
BCE171	Civil Engineering Project I	2
BCE172	Hydropower Engineering	3
BCE173	Project and Procurement Management	4
BCE174	Design of Reinforced Concrete Structures	4
BCE175	Estimating and Valuation	3
BCE176	Elective II	3
BCE177	Elective III	3
	Total	22

Semester VIII

Course Code	Course Title	Credits
BCE181	Civil Engineering Project II	4

Course Code	Course Title	Credits
BCE182	Internship	6
	Total	10

Elective Courses

Elective I

- Environmental and Social Impact Assessment
- Low Volume Road Engineering
- Advanced Structural Analysis
- Bio Engineering
- Seismic Vulnerability Assessment and Retrofitting Techniques
- Hydraulic Machines
- Structural Dynamics
- Energy Engineering

Elective II

- Solid Waste Management
- Design of Reinforced Concrete Bridge
- Finite Element Method
- Rock Mechanics
- Disaster Risk Management

Elective III

- Geographic Information System
- Airport and Railway Engineering
- Earthquake Resistant Structural Design
- Ropeway Engineering
- Tunneling and Underground Structures
- Technology Environment and Society
- Prestressed Concrete

Teaching Learning Methodology

The BE Civil Engineering program adopts Outcome-Based Education (OBE) and student-centered teaching methodologies:

- Interactive lectures
- Tutorials and assignments
- Laboratory work
- Project-based learning
- Field visits and survey camps
- Software-based learning
- Group discussions and seminars
- Industry interaction
- Internship and field exposure
- Design-based learning

Assessment System

The assessment system consists of:

Internal Assessment

- Assignments
- Quizzes
- Attendance
- Presentations
- Laboratory performance
- Mini projects
- Design exercises

External Assessment

- End semester examinations
- Practical examinations
- Viva voce
- Project evaluation
- Internship evaluation

Software and Modern Tool Integration

The program integrates modern software and engineering tools including:

- AutoCAD
- Civil 3D

- SAP2000
- STAAD Pro
- ETABS
- EPANET
- HEC-RAS
- ArcGIS/QGIS
- MS Project
- Primavera
- Numerical computing tools

Internship and Project Work

Internship

A 15-week professional internship is conducted during the final semester to provide real-world engineering exposure.

Project Work

Students complete:

- Civil Engineering Project I
- Civil Engineering Project II

Projects focus on:

- Design
- Analysis
- Field investigation
- Sustainability
- Economic feasibility
- Professional reporting

Graduate Attributes

Graduates of the BE Civil program will possess:

- Technical competence
- Professional ethics
- Leadership and teamwork skills

- Communication skills
- Problem-solving capability
- Design competency
- Sustainability awareness
- Research and innovation capability
- Lifelong learning attitude

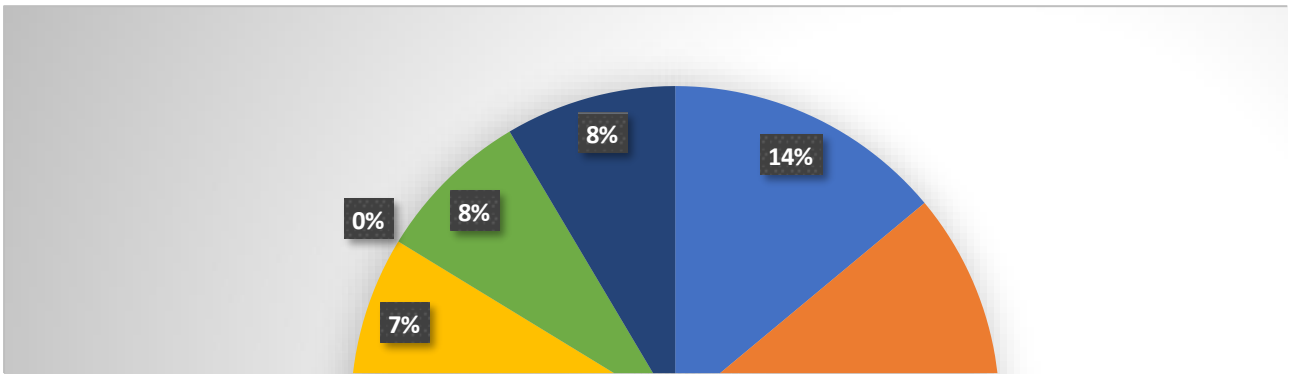
Conclusion

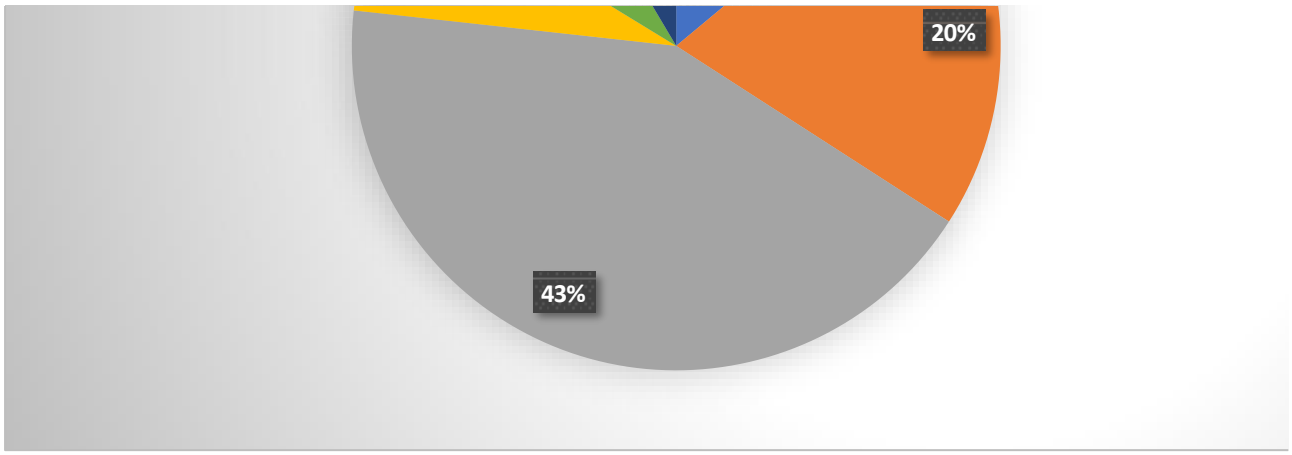
The redesigned Bachelor of Civil Engineering program of Mid-West University is structured to meet national and international engineering education standards while addressing Nepal's infrastructure development needs. The curriculum integrates engineering fundamentals, practical learning, design competency, sustainability, software applications, professional ethics, and industry exposure.

The program prepares graduates for professional engineering practice, higher studies, research, entrepreneurship, and leadership roles in the civil engineering sector.

Semester	Course Code	Course Category	Course Titles	Credit	Lecture (L)	Tutorial (T)
I		ASC	Applied Chemistry	2	2	1
		ASC	Applied Physics	3	3	1
		ASC	Calculus I	3	3	2
		ESC	Computer Programming	3	3	1
		ESC	Engineering Drawing	2	0	0
		ESC	Applied Mechanics (Statics)	2	2	2
			Sub-total	**15**	**13**	**7**
II		ASC	Algebra and Geometry	3	3	2
		ESC	Applied Mechanics (Dynamics)	2	2	2
		ESC	Basic Electrical and Electronics Engineering	3	3	2
		PCC	Civil Engineering Materials	2	2	0
		ESC	Civil Engineering Workshop	1	0	0
		ESC	Engineering Geology	3	3	0
		ESC	Introduction to Energy Engineering	2	2	1
			Sub-total	**16**	**15**	**7**
III		PCC	Building Technology	2	2	0
		ASC	Calculus II	3	3	2
		ESC	Fluid Mechanics	3	3	2
		ASC	Numerical Methods	2	2	1
		PCC	Strength of Materials	3	3	2
		PCC	Surveying I	3	3	1
			Sub-total	**16**	**16**	**8**
IV		PI	Project I	1	0	1
		ESC	Hydraulics	3	3	2
		ASC	Probability and Statistics	2	2	2
		HSC	Communication Techniques	2	2	2
		PCC	Soil Mechanics	3	3	2
		PCC	Structural Analysis I	3	3	2
		PCC	Surveying II	3	3	1
			Sub-total	**17**	**16**	**12**
V		ESC	Engineering Hydrology	2	2	2
		PI	Survey Field Project	1	0	0
		PCC	Foundation Engineering	3	3	2
		PCC	Structural Analysis II	3	3	2
		PCC	Transportation Engineering I	3	3	1

		PCC	Water Supply Engineering	3	3	2
		PCC	Concrete Technology and Masonry Structure	3	3	2
			Sub-total	**18**	**17**	**11**
VI		HSC	Engineering Economics	3	3	2
		PCC	Design of Steel and Timber Structure	3	3	2
		PEC	Elective I	3	3	0
		PCC	Irrigation and Drainage Engineering	3	3	2
		PCC	Sanitary Engineering	3	3	2
		PCC	Transportation Engineering II	3	3	1
			Sub-total	**18**	**18**	**9**
VII		PI	Project II	3	0	0
		HSC	Construction Project Management	3	3	2
		PCC	Design of R.C.C. Structures	3	3	2
		PCC	Estimating and Valuation	3	3	2
		PEC	Elective II	3	3	0
		PCC	Hydropower Engineering	3	3	2
			Sub-total	**18**	**15**	**8**
VIII		PEC	Elective III	3	3	0
		HSC	Engineering Professional Practice	2	2	0
		PI	Internship	6	0	0
			Sub-total	**11**	**5**	**0**
				129	**115**	**62**



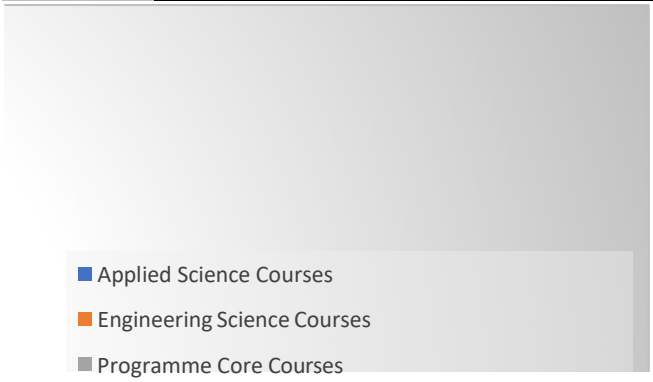

20%
43%

Practical (P)	Total Hours (L+T+P)		Applied Science Courses (ASC)	Engineering Science Courses (ESC)	Programme Core Courses (PCC)	Programme Elective Courses (PEC)	Open Electives Courses (OEC)
2	**5**		**2**				
2	**6**		**3**				
0	**5**		**3**				
2	**6**			3			
6	**6**			2			
0	**4**			2			
12	**32**						
0	**5**		**3**				
0	**4**			2			
2	**7**			3			
2	**4**				**2**		
3	**3**			1			
2	**5**			3			
1	**4**			2			
10	**32**						
2	**4**				**2**		
0	**5**		**3**				
2	**7**			3			
2	**5**		**2**				
1	**6**				**3**		
3	**7**				**3**		
10	**34**						
2	**3**						
2	**7**			3			
0	**4**		**2**				
0	**4**						
2	**7**				**3**		
1	**6**				**3**		
3	**7**				**3**		
10	**38**						
1	**5**			2			
2	**2**						
1	**6**				**3**		
1	**6**				**3**		
1	**5**				**3**		

1	**6**				**3**		
2	**7**				**3**		
9	**37**						
0	**5**						
0	**5**				**3**		
0	**3**					**3**	
0	**5**				**3**		
1	**6**				**3**		
1	**5**				**3**		
2	**29**						
6	**6**						
0	**5**						
1	**6**				**3**		
0	**5**				**3**		
0	**3**					**3**	
1	**6**				**3**		
8	**31**						
0	**3**					**3**	
0	**2**						
12	**12**						
12	**17**						
73	**250**						

Total count		7	11	19	3	0
Total credit		18	26	55	9	0

		Applied Science Courses	Engineering Science Courses	Programme Core Courses	Programme Elective Courses	Open Electives Courses
Percentage		14.0	20.2	42.6	7.0	0.0




Programme Elective Courses
Open Electives Courses
Humanities, Social Science and Management Courses
Project, Internship and Industrial Training

Humanities, Social Science and Management Courses (HSC)	Project, Internship and Industrial Training (PI)

	1
2	

	1

3	

	3
3	

2	
	6

4	4	**48**
10	11	**129**

Humanities, Social Science and Management Courses	Project, Internship and Industrial Training
7.8	8.5

Annexure 4

Sample Civil Engineering Course Curriculum Detailing of

1. Tribhuvan University
2. Purbanchal University
3. Kathmandu University
4. Manmohan Technical University
5. Lumbini Technical University
6. Far Western University
7. Mid Western University and
8. Pokhra University

Sample Course Curriculum Detailing Format

A)	**Course Title: Environmental Impact Assessment**
B)	**Course Code: CE PEC601**
C)	**Major Pre- requisite Course (s): Engineering Chemistry, Environmental Engineering**

D) Rationale:

This course provides an overview on concepts, principles, methodology and applications of environmental studies (ES), Brief Environmental Study (BES), Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA).

E) Course Outcomes (COs):

After the completion of the course, teachers are expected to ensure the attainment of following course outcomes by the learners.

Course Outcomes (COs)	Course Outcome Statements
The students will be able to	
CO1	Identify the environmental attributes to be considered for the EIA study.
CO2	Use a variety of professional tools for predicting environmental impacts.
CO3	Evaluate the methodology to prepare EIA.
CO4	Formulate the methodology for Environmental Auditing.
CO5	Develop their own perspectives on Impact assessment and able to relate this to other subject areas

F) Course Articulation Matrix (CAM):

Course Outcomes (COs	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)*	
	PO1 Engineering Knowledge	**PO2** Problem Analysis	**PO3** Design/ Development of Solutions	**PO4** Investigation	**PO5** Modern Tool Usage	**PO6** The Engineer and The Society	**PO7** Ethics	**PO8** Individual and Collaborative Team Work	**PO9** Communication	**PO10** Project Management and Finance	**PO11** Life-long Learning	**PSO1**	**PSO2**
CO1	√			√	√							2	
CO2		√			√								3
CO3	√	√		√				√					3
CO4	√			√		√	√	√	√				2
CO5	√							√				2	2

Legend: High (3), Medium (2), Low (1) and No mapping (-) Optional (*)

Sample Course Curriculum Detailing Format

G) Teaching and Examination Scheme:

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CE PEC601	PEC	Elective I (Environmental Impact Assessment)	3	3	1	1	5	40	60	25	-	125

Legend:
L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical
Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Core Elective (PCE), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

H) Course Curriculum Detailing: For attainment of course outcomes, the students are expected to perform/ undergo various activities through classroom, laboratories, workshops, tutorials, micro project, assignments, field sessions, self- learning assignment etc.
Unique features like green skills, SDGs, multidisciplinary aspects, Love for our own country, motivation for startups, societal connect, renewable energy, etc. are integrated appropriately in the course curriculum document.

I) CO(s) Wise Suggested Contents:

Mapped CO(s) Number	Contents
CO1 (Identify the environmental attributes to be considered for the EIA study)	**Unit- 1.0: Fundamentals of Environmental Impact Assessment** 1.1 Definition and significance of EIA 1.2 Historical development globally and in context of Nepal 1.3 EIA in project cycle 1.4 Types of EIA 1.5 Sustainable Development Goals 1.6 Importance of EIA in sustainable development
CO1 (Identify the environmental attributes to be considered for the EIA study.)	**Unit- 2.0: Screening, Scoping and Terms of Reference** 2.1 Introduction, importance and Criteria of Screening 2.2 Screening Process in Nepal 2.3 Introduction, objective and benefits of Scoping 2.4 Methods and Process of Scoping 2.5 Introduction and Outline of Terms of Reference (TOR) 2.6 TOR in context of Nepal
CO2 (Use a variety of professional tools for predicting environmental impacts.), CO3 (Evaluate the methodology to prepare EIA)	**Unit- 3.0: Baseline data and Methodologies** 3.1 Baseline monitoring 3.2 Types of baseline data 3.3 Methods of data collection 3.4 Baseline study practices in Nepal .

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Contents
CO1 (Identify the environmental attributes to be considered for the EIA study.), CO2 (Use a variety of professional tools for predicting environmental impacts.),	**Unit- 4.0: Impact Identification, Prediction and Evaluation** 4.1 Impact categories 4.2 Methods of impact prediction 4.3 Choice of prediction method 4.4 Methods of impact evaluation 4.5 Nepal EIA Regulations: Guidelines, Public Hearing and Legal Provisions
CO2 (Use a variety of professional tools for predicting environmental impacts.), CO5 (Develop their own perspectives on Impact assessment and able to relate this to other subject areas)	**Unit- 5.0: Mitigation and Management Plan** 5.1 Introduction and objectives of mitigation measures 5.2 Mitigation hierarchy 5.3 Introduction to environmental management plan (EMP) 5.4 Implementation of EMP 5.5 Environmental monitoring 5.6 Environmental Auditing
CO4 (Formulate the methodology for Environmental Auditing), CO5 (Develop their own perspectives on Impact assessment and able to relate this to other subject areas)	**Unit- 6.0: Environmental Study Report and Format** 6.1 Brief Environmental Study (BES) and Initial Environmental Examination (IEE) report structure 6.2 Environmental Impact Assessment (EIA) report structure 6.3 Approval process of EA reports in Nepal

J) CO(s) Wise Suggested List of Practicals:

Mapped CO(s) Number	Laboratory Experiment/ Practicals
CO1	1 ……. 2 …… 3 ……..

Note: Rubrics need to be prepared for effective performance by each student and their valid and reliable assessment.

K) Suggested In Semester Activities: This may include complex engineering problems, micro projects, seminar, self-learning, industrial/ field visit, assignment etc. It reinforces the development of spectrum of abilities needed for attainment of course outcomes. Complex engineering problems and micro projects need to be provided to learners to develop the problem solving, analytical, critical thinking, creative, investigative, exploring abilities in the learners and to prepare them as future ready work force. MOOCs, spoken tutorials, online educational resources etc. may be used for Self-Learning.

a. Suggested Complex Engineering Problems:

S. No.	Suggested Complex Engineering Problems
1.	Investigate on Socio- Economic Impacts due to any project activity and Suggest mitigating measures

Sample Course Curriculum Detailing Format

b. Suggested Micro Projects:

S. No.	Suggested Micro Projects
1.	Project screening for any one development project
2.	Prepare a brief TOR for baseline studies of a sample civil engineering project.
3.	Prepare a short EA report for the project.

c. Suggested Seminar Topics, Self- Learning Topics, Industrial Visits/Field Demonstration/Any other relevant activity, as applicable:

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/ Field Demonstration	Any other Relevant Activity
1.	"Impact of project on individuals earning"			

Sample Course Curriculum Detailing Format

L) Suggested Instructional/ Implementation Strategies: Different instructional/ learning/ implementation strategies may be used appropriately, as per the requirement of the level of learners and outcome to be achieved. Some of them are improved lecture, tutorial, case method, group discussion, industrial visits, industrial training, field trips, role play, live demonstrations in classrooms, lab, field, project work, self-learning, etc. Use of Information and Communications Technology (ICT) based teaching learning, blended or flipped mode, brainstorming, expert session, video clippings, Online Educational Resources (OER), MOOCs, etc. are the some of the suggestive methods/ strategies to be adopted appropriately.

The relevant instructional/ implementation strategies may be mentioned appropriately as per the requirement of CO.

CO Statement	Suggested Relevant Instructional/ Implementation Strategies	Suggested Required Resources

M) Suggested Learning Resources:

a) Books

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Environmental impact assessment: Process and practice	Glasson, J., Therivel, R., & Chadwick, A.	(5th ed.). Routledge
2.	Environmental impact assessment: Process and practice	Uprety, B. K	IUCN Nepal.

b) Online Educational Resources (OER):

1. Environmental Protection Act, 2076, Ministry of Forest and Environment, Government of Nepal
2. Environmental Protection Rules, 2077, Ministry of Forest and Environment, Government of Nepal
3. EIA Training Manual for Professionals and Managers, 1996, IUCN-The World Conservation Union

Sample Course Curriculum Detailing Format

c) Suggested List of Equipment: (For Class Size- 30)

S. No.	Name of the Equipment	Suggested Specifications	Remarks
1.			
2.			

N) (a) Course Curriculum Development Team (Respective Universities)

S. No.	Name and Designation	E-mail Address
1.	Arun Parajuli,Associate Professor	XYZ@ioe.edu.np
2.		

(b) Course Curriculum Development Team (Academia & Experts)

S. No.	Name and Designation	E-mail Address
1.		
2.		

****

Sample Course Curriculum Detailing Format

A)	**Course Title: Engineering Professional Practice**
B)	**Course Code: C801**
C)	**Major Pre- requisite Course (s):** Civil Engineering Design subjects, project, contract management course, economic & finance courses.

D) Rationale:

This course prepares civil engineering students for professional practice by developing knowledge of engineering ethics, professional responsibilities, conflict management and ethical decision making required for responsible and sustainable engineering practice.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the attainment of following course outcomes by the learners.

Course Outcomes (COs)	Course Outcome Statements
C8O1.1	Apply engineering ethics, codes and professional standards to analyze ethical dilemmas and make responsible decisions in civil engineering practice.
C8O1.2	Demonstrate effective communication, teamwork and leadership skills in professional environments.
C8O1.3	Analyze contracts, conflict management, safety and rick issues in engineering projects.
C8O1.4	Evaluate environmental, social and economic impact of engineering decisions.
C8O1.5	Recognize the importance of continues professional development and lifelong learning.

F) Course Articulation Matrix (CAM):

Course Outcomes(COs	Program Outcomes (POs)											Program SpecificOutcomes (PSOs)		
	PO1 Engineering Knowledge	**PO-2** Problem Analysis	**PO-3** Design/ Development of Solutions	**PO-4** Investigation	**PO5** Modern Tool Usage	**PO6** The Engineer and The Society	**PO7** Ethics	**PO8** Individual and Collaborative Team Work	**PO9** Communication	**PO10** Project Management and Finance	**PO11** Life-long Learning	**PSO-1** Career in Engineering & Profession	**PSO-2** Research in Emerging Issue	**PSO-3** Earthquake resilient structure
CO1	2	2	-	-	-	2	3	1	1	-	1	3	*	*
CO2	1	-	-	-	-	2	2	3	3	2	1	2	*	*
CO3	2	3	1	-	-	3	2	2	2	3	1	3	1	2
CO4	2	2	1	1	-	3	3	1	2	2	2	2	2	1
CO5	1	-	-	-	1	2	2	1	1	1	3	3	2	*

Legend: High (3), Medium (2), Low (1) and No mapping (-) , Optional (*)

Sample Course Curriculum Detailing Format

G) Course Curriculum Detailing: For attainment of course outcomes, the students are expected to perform/ undergo various activities through classroom, laboratories, workshops, tutorials, micro project, assignments, field sessions, self- learning assignment etc.

Unique features like green skills, SDGs, multidisciplinary aspects, Love for our own country, motivation for startups, societal connect, renewable energy, etc. are integrated appropriately in the course curriculum document.

H) CO(s) Wise Suggested Contents:

Mapped CO(s) Number	Contents
CO1: Apply engineering ethics, codes and professional standards to analyze ethical dilemmas and make responsible decisions in civil engineering practice.	**Unit- 1.0: Engineering Profession, Ethics and Professionalism** 1.1 Professional Ethics, Moral Principles and Codes of Ethics in Civil Engineering Practice 1.2 Analyze Ethical Dilemmas, Professional Misconduct, Negligence and Conflict of Interest in Engineering Projects 1.3 Professional Responsibilities, Accountability and Integrity in Engineering Decision-Making and Practice 1.4 Apply Ethical Judgment for Public Safety, Sustainability and Social Welfare in Contracts, Consultancy and Construction Practices 1.5 Real-World Ethical Case Studies in Civil Engineering Practice
CO2: Demonstrate effective communication, teamwork and leadership skills in professional environments.	**Unit- 2.0: Professional Communication and Leadership** 2.1 Effective Professional and Technical Communication Skills in Civil Engineering Practice 2.2 Teamwork, Collaboration and Interpersonal Skills in Multidisciplinary Professional Environments 2.3 Leadership Principles, Team Management and Decision-Making Skills in Engineering Projects 2.4 Conflict Resolution, Negotiation and Coordination Skills in Professional Practice 2.5 Demonstrate Professional Responsibilities toward Society, Clients and Environment with Commitment to Lifelong Learning 2.6 Analyze Communication, Leadership and Professional Practice Case Studies in Civil Engineering Projects including Nepali Contexts
CO3: Analyze contracts, conflict management, safety and rick issues in engineering projects.	**Unit- 3.0: Engineering Laws, Contracts and Procurement** 3.1 Engineering Laws, Legal Responsibilities and Professional Liabilities in Civil Engineering Practice 3.2 Analyze Procurement Systems, Tendering and Bidding Procedures in Engineering Projects 3.3 Contract Laws, Types of Contracts and Contract Administration Practices 3.4 Safety, Risk and Tort Liability Issues in Engineering Projects 3.5 Claims, Disputes, Conflict Management and Arbitration Processes in Construction Projects 3.6 Analyze Contractual, Legal and Risk-Related Case Studies in Civil Engineering Projects including Public Private Partnership (PPP) Practices
CO4:	**Unit- 4.0: Occupational health, Safety and Risk Management** 4.1 Occupational Health, Safety and Environmental Protection Principles in Civil Engineering Projects

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Contents
Evaluate environmental, social and economic impact of engineering decisions.	4.2 Construction Safety Practices, Safety Standards and Regulatory Requirements 4.3 Hazard Identification, Risk Assessment and Risk Mitigation Measures in Engineering Practice 4.4 Evaluate Environmental, Social and Economic Impacts of Safety and Risk-Related Engineering Decisions 4.5 Emergency Preparedness, Disaster Management and Resilience Strategies in Civil Engineering Projects 4.6 Evaluate Safety Failures, Environmental Risks and Sustainable Risk Management Case Studies in Civil Engineering Practice
CO5: **Recognize the importance of continues professional development and lifelong learning.**	**Unit- 5.0: Engineering Professional Practice and Lifelong Learning in Nepal** 5.1 Role of Professional Bodies, Governing Agencies and Professional Societies in Engineering Practice in Nepal 5.2 Engineering Policies, Acts, Regulations and Professional Responsibilities in Public and Private Sectors 5.3 Recognize the Importance of Continuous Professional Development, Licensure and Lifelong Learning for Professional Engineers 5.4 Impact of Globalization and Cross-Cultural Practices in Engineering Profession 5.5 Opportunities and Responsibilities in Consultancy Practice, Entrepreneurship and Sustainable Development 5.6 Recognize Professional Practice Case Studies and Emerging Trends in Engineering Profession in Nepal and Global Contexts
CO1, CO2, CO4, CO5	**Unit- 6.0: Emerging Professional Practices, Governance and Inclusive Engineering** 6.1 Digital Ethics and Responsible Use of Emerging Technologies in Civil Engineering Practice 6.2 Analyze Ethical Issues Related to Data Management, Artificial Intelligence, BIM and Digital Engineering Tools 6.3 Stakeholder Communication, Community Engagement and Public Participation in Engineering Projects 6.4 Evaluate Project Governance, Transparency, Accountability and Organizational Ethics in Engineering Practice 6.5 Principles of Gender Equality, Diversity and Inclusive Professional Practice in Engineering Environments 6.6 Analyze Case Studies on Digital Ethics, Governance, Community Engagement and Inclusive Engineering Practices

I) **Suggested In Semester Activities:** This may include complex engineering problems, micro projects, seminar, self-learning, industrial/ field visit, assignment etc. It reinforces the development of spectrum of abilities needed for attainment of course outcomes. Complex engineering problems and micro projects need to be provided to learners to develop the problem solving, analytical, critical thinking, creative, investigative, exploring abilities in the learners and to prepare them as future ready work force. MOOCs, spoken tutorials, online educational resources etc. may be used for Self-Learning.

a. Suggested Complex Engineering Problems:

Sample Course Curriculum Detailing Format

S. No.	Suggested Complex Engineering Problems
1.	**Ethical and Professional Decision-Making in Large Infrastructure Projects** Analyze ethical dilemmas, stakeholder conflicts, safety concerns, environmental impacts and professional accountability issues arising during the planning and execution of a major civil engineering project.
2.	**Contractual Disputes, Risk and Safety Management in Construction Projects** Evaluate procurement procedures, contract administration, claims, delays, safety failures and dispute resolution mechanisms in complex construction projects involving multiple stakeholders.
3.	**Sustainable and Inclusive Engineering Practice in Emerging Digital Environments** Assess the environmental, social and economic impacts of engineering decisions while addressing digital ethics, governance, community engagement, diversity and sustainable development challenges in civil engineering practice.

b. Suggested Micro Projects:

S. No.	Suggested Micro Projects
1.	**Ethical and Safety Assessment of a Local Construction Project** Conduct a field-based assessment of a local civil engineering project to evaluate professional ethics, safety practices, environmental considerations, stakeholder responsibilities and compliance with engineering standards.
2.	**Case Study Analysis on Contract Management and Professional Practice** Analyze a real or published civil engineering project focusing on contract procedures, risk management, leadership practices, conflict resolution and ethical decision-making, and prepare a professional report with recommendations.

c. Suggested Seminar Topics, Self- Learning Topics, Industrial Visits/Field Demonstration/Any other relevant activity, as applicable:

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/ Field Demonstration	Any other Relevant Activity
1.	Ethics and Professional Accountability in Civil Engineering Practice	Nepal Engineering Council Act, Regulations and Code of Ethics	NEPCA office field visit for visualizing conflict management practice	Mock ethical dilemma analysis and professional decision-making exercise
2.	Public Private Partnership (PPP), Contract Management and Dispute Resolution in Infrastructure Projects	Public Procurement Act and Contract Administration Procedures, FIDIC Contracts	Visit to an ongoing construction project for safety and risk assessment	**Panel Discussion on-** Professional Practice and Leadership Cases
3.	Safety Culture and Risk Management	Global Engineering Practices and	Interaction with contractors, consultants and project	Group discussion on engineering

Sample Course Curriculum Detailing Format

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/ Field Demonstration	Any other Relevant Activity
	in Construction Projects	Washington Accord Provisions	managers on dispute and risk management	failures and lessons learned
4.	Consultancy Practice and Entrepreneurship	Arbitration and Legal Remedies		Preparation and presentation of professional case study reports

D) Course Curriculum Development Team (Respective Universities)

S. No.	Name and Designation	E-mail Address
1.	Er. Samit Thapa (PhD)	
2.	Er. Sujan Maka	
3.	Er. Dev Raj Joshi	drj.devrajjoshi@gmail.com
4.	Er. Rabin Bhattarai	

(b) Course Curriculum Development Team (Academia & Experts)

S. No.	Name and Designation	E-mail Address
1.		
2.		

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Sample Course Curriculum Detailing Format

A)	**Course Title: Elective I: Rock Engineering**
B)	**Course Code:**
C)	**Major Pre- requisite Course (s): Engineering Geology, Strength of Materials**

D) Rationale: This course provides fundamental and applied knowledge of rock mechanics and underground construction essential for tunneling, hydropower, and other geotechnical engineering projects. It enables students to analyze rock mass behavior, design underground support systems, and apply modern investigation and excavation techniques considering safety, sustainability, and economic feasibility.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the attainment of following course outcomes by the learners.

Course Outcomes (COs)	Course Outcome Statements
CO1	Analyze rock mass behavior, in-situ stresses, groundwater conditions, and failure mechanisms using principles of rock mechanics and engineering geology.
CO2	Apply rock mass classification systems to estimate support requirements for underground excavation projects.
CO3	Design underground openings and tunnel support systems considering stability, safety, constructability, and sustainability requirements.
CO4	Evaluate excavation methods and innovative rock engineering solutions for efficient and economical hydropower and underground infrastructure development.

F) Course Articulation Matrix (CAM):

Course Outcomes (COs	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)*		
	PO1 Engineering Knowledge	**PO2** Problem Analysis	**PO3** Design/ Development of Solutions	**PO4** Investigation	**PO5** Modern Tool Usage	**PO6** The Engineer and The Society	**PO7** Ethics	**PO8** Individual and Collaborative Team Work	**PO9** Communication	**PO10** Project Management and Finance	**PO11** Life-long Learning	**PSO1**	**PSO2**	**PSO3**
CO1		3												
CO2		2		2										
CO3			3							1				1
CO4						1				1	1	1		

Legend: High (3), Medium (2), Low (1) and No mapping (-)
Optional (*)

Sample Course Curriculum Detailing Format

G) Teaching and Examination Scheme:

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
		PCE	Elective I: Rock Engineering	3	2	1		3	60	40			100

Legend:
L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical
Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Core Elective (PCE), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

H) Course Curriculum Detailing: For attainment of course outcomes, the students are expected to perform/ undergo various activities through classroom, laboratories, workshops, tutorials, micro project, assignments, field sessions, self- learning assignment etc.
Unique features like green skills, SDGs, multidisciplinary aspects, Love for our own country, motivation for startups, societal connect, renewable energy, etc. are integrated appropriately in the course curriculum document.

I) CO(s) Wise Suggested Contents:

Mapped CO(s) Number	Contents
CO1	**Unit- 1.0: Properties of Rocks and Rock Masses** 1.1 Physical properties of rocks 1.2 Time-dependent behaviours: creep, swelling, squeezing 1.3 Mechanical Properties: drillability, blastability, cuttability, abrasivity 1.4 Rock anisotropy and heterogeneity 1.5 Discontinuity characterization: spacing, orientation, roughness (JRC, JCS) 1.6 Weakness zones and faults
CO1	**Unit- 2.0: Rock Stresses and its Measurement** 2.1 Origin of rock stresses 2.2 Stress redistribution around openings 2.3 Stability problems due to stress

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Contents
	2.4 Measurement of rock stress: flat jack, overcoring, hydro-fracturing
CO1	**Unit- 3.0: Groundwater in Rock Masses** 3.1 Hydrological characterization in fractured media 3.2 Groundwater inflow prediction methods 3.3 Problems caused by groundwater 3.4 Sealing of water leakage: grouting and seepage control techniques
CO2	**Unit- 4.0: Rock Mass Classification and Support Estimation** 4.1 Quality rating and support estimation 4.1.1 RMR System 4.1.2 NGI Q System 4.1.3 Geological Strength Index (GSI) 4.1.4 The RMi – support method 4.2 Comparison of classification systems for rock support estimates
CO3, CO4	**Unit- 5.0: Design Approach and excavation of Underground Openings** 5.1 Design philosophy and approaches 5.2 Shallow seated and deep seated openings 5.3 Design procedures 5.4 Drill and Blast method 5.5 Tunnel Boring Machine 5.6 Sequential excavation methods: SEM, NATM
CO4	**Unit- 6.0: Improved and Cost Saving Solutions** 6.1 Unlined high – pressure Tunnels and shafts 6.2 Unlined air cushion surge chamber 6.3 Innovative and sustainable support materials

J) CO(s) Wise Suggested List of Practicals:

Mapped CO(s) Number	Laboratory Experiment/ Practicals
CO1	1 ……. 2 …… 3 …….
CO2, CO3	4 …….. 5 ……. 6 …….
CO3	7 ……. 8 ……..
CO4	9 …… 10 ……. 11 ……..

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Laboratory Experiment/ Practicals
CO5	12 …….. 13 …….. 14 …….

Note: Rubrics need to be prepared for effective performance by each student and their valid and reliable assessment.

K) Suggested In Semester Activities: This may include complex engineering problems, micro projects, seminar, self-learning, industrial/ field visit, assignment etc. It reinforces the development of spectrum of abilities needed for attainment of course outcomes. Complex engineering problems and micro projects need to be provided to learners to develop the problem solving, analytical, critical thinking, creative, investigative, exploring abilities in the learners and to prepare them as future ready work force. MOOCs, spoken tutorials, online educational resources etc. may be used for Self-Learning.

a. Suggested Complex Engineering Problems:

S. No.	Suggested Complex Engineering Problems
1.	Stability analysis and support design of underground hydropower tunnels in weak and jointed rock masses
2.	Evaluation of groundwater inflow and seepage control measures in underground excavations
3.	Selection of suitable excavation methods for deep underground openings under varying geological conditions
4.	Rock mass classification and support estimation for tunnel construction using RMR, Q-system, and RMi methods
5.	Assessment and mitigation of stress-induced deformation and failure around underground openings

b. Suggested Micro Projects:

S. No.	Suggested Micro Projects
1.	Rock mass classification of a selected tunnel or slope using RMR and Q-system
2.	Case study on excavation and support techniques adopted in underground hydropower projects in Nepal
3.	Design support for an underground opening using Phase/Plaxis/Geo5/etc.

c. Suggested Seminar Topics, Self- Learning Topics, Industrial Visits/Field Demonstration/Any other relevant activity, as applicable:

Sample Course Curriculum Detailing Format

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/ Field Demonstration	Any other Relevant Activity
1.	Rock Mass Classification Systems (RMR, Q-System, GSI) and their engineering significance	Basics of underground excavation and NATM principles	Field visit to tunnel hydropower under-construction	Mini-project on tunnel support design using real case data
2.	Underground Excavation Methods: Drill and Blast vs TBM vs SEM	Detailed study of RMR and Q-system charts and worked examples	Visit to construction site showing rock support installation (shotcrete, rock bolts, steel ribs)	Case study review of groundwater issues in hydropower tunnels
3.	Rock Support Systems and Design Approaches for Underground Openings	Video-based learning on TBM operations and blasting techniques		
4.		Grouting methods, seepage analysis, and waterproofing techniques		
5.		Use of software tools (Geo5 / PLAXIS) for support design		

Sample Course Curriculum Detailing Format

L) Suggested Instructional/ Implementation Strategies: Different instructional/ learning/ implementation strategies may be used appropriately, as per the requirement of the level of learners and outcome to be achieved. Some of them are improved lecture, tutorial, case method, group discussion, industrial visits, industrial training, field trips, role play, live demonstrations in classrooms, lab, field, project work, self-learning, etc. Use of Information and Communications Technology (ICT) based teaching learning, blended or flipped mode, brainstorming, expert session, video clippings, Online Educational Resources (OER), MOOCs, etc. are the some of the suggestive methods/ strategies to be adopted appropriately.

The relevant instructional/ implementation strategies may be mentioned appropriately as per the requirement of CO.

CO Statement	Suggested Relevant Instructional/ Implementation Strategies	Suggested Required Resources
CO1: Analyze rock mass behavior, in-situ stresses, groundwater conditions, and failure mechanisms using principles of rock mechanics and engineering geology.	Lectures, numerical problem solving, laboratory demonstrations, case studies, field investigations	Rock mechanics laboratory equipment, geological maps, field investigation reports, reference books
CO2: Apply rock mass classification systems to estimate support requirements for underground excavation projects.	Tutorial exercises, field mapping, classification exercises, case-based learning	RMR/Q-system charts, geological mapping tools, tunnel case studies, design manuals
CO3: Design underground openings and tunnel support systems considering stability, safety, constructability, and sustainability requirements.	Design projects, group discussions, seminars, software-based analysis	Tunnel design manuals, support system catalogs, engineering standards, rock engineering software
CO4: Evaluate excavation methods and innovative rock engineering solutions for efficient and economical hydropower and underground infrastructure development.	Technical seminars, industry interaction, project-based learning, self-learning assignments	Hydropower project reports, research articles, OER platforms, audiovisual materials

M) Suggested Learning Resources:

a) Books

Sample Course Curriculum Detailing Format

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Rock Engineering	B. Nilsen and A. Palmström	CRC Press, 2017 Edition, ISBN: 9781138000780
2.	Engineering Geology and Rock Engineering	B. Nilsen and A. Palmström	CRC Press, 2000 Edition, ISBN: 9789054104599
3.	Rock Engineering	A. Palmström and H. Stille	CRC Press, 2nd Edition, 2015, ISBN: 9781482230000
4.	Fundamentals of Rock Mechanics	Jaeger, Cook, and Zimmerman	Wiley-Blackwell, 4th Edition, ISBN: 9780632057597

b) Online Educational Resources (OER):

1) https://www.rocscience.com/learning
2) ISR https://isrm.net

c) Suggested List of Equipment: (For Class Size- 30)

S. No.	Name of the Equipment	Suggested Specifications	Remarks
1.	Audio-visual assembly	Functional compatible to laptop	
2.	Computer Lab	i5 or higher	
3.	Geo5 Software / Phase / PLAXIS	Student version latest	

N) (a) Course Curriculum Development Team (Respective Universities)

S. No.	Name and Designation	E-mail Address
1.	Er. Sujan Maka	sujanmaka@khec.edu.np
2.	Subeg Man Bijukchhen (PhD)	

(b) Course Curriculum Development Team (Academia & Experts)

S. No.	Name and Designation	E-mail Address
1.	Arpan Bahadur Singh (NEA)	
2.	Xyz xyz (NTA)	

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Sample Course Curriculum Detailing Format

A)	**Course Title: Hydropower Engineering I**	**University Logo**
B)	**Course Code: CIEG 307**	
C)	**Major Pre- requisite Course (s): Fluid Mechanics, Hydraulics, Hydrology**	

D) Rationale: Hydropower is one of the major renewable energy resources and plays a vital role in the economic development of Nepal. This course is designed to provide fundamental and practical knowledge related to planning, design, and operation of hydropower projects. The course enables students to understand various components of hydropower schemes including headworks, conveyance structures, powerhouse, and power potential analysis. It also develops analytical and design skills required in hydropower engineering practice.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the attainment of following course outcomes by the learners.

Course Outcomes (COs)	Course Outcome Statements
CO1	Describe Hydropower Engineering in Nepal with respect to historical context, present context and challenges of hydropower development in Nepal.
CO2	Estimation of hydropower potential.
CO3	Design of headworks of Run-of River plants.
CO4	Design of water conveyance system of Run-of River plants.
CO5	Design of Powerhouse of Run-of River plants.

F) Course Articulation Matrix (CAM):

Course Outcomes (COs	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)*	
	PO1 Engineering Knowledge	**PO2** Problem Analysis	**PO3** Design/ Development of Solutions	**PO4** Investigation	**PO5** Modern Tool Usage	**PO6** The Engineer and The Society	**PO7** Ethics	**PO8** Individual and Collaborative Team Work	**PO9** Communication	**PO10** Project Management and Finance	**PO11** Life-long Learning	**PSO1**	**PSO2**
CO1		✓	✓			✓		✓			✓	✓	
CO2		✓	✓		✓			✓			✓	✓	
CO3		✓	✓	✓		✓		✓✓			✓	✓	
CO4													
CO5													

Legend: High (3), Medium (2), Low (1) and No mapping (-)
Optional (*)

Sample Course Curriculum Detailing Format

G) Teaching and Examination Scheme:

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CIEG 307	PCC	Hydropower Engineering I	3	2	1	-	45	50	50	-	-	100

Legend:
L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical
Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Core Elective (PCE), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

H) Course Curriculum Detailing: For attainment of course outcomes, the students are expected to perform/ undergo various activities through classroom, laboratories, workshops, tutorials, micro project, assignments, field sessions, self- learning assignment etc.
Unique features like green skills, SDGs, multidisciplinary aspects, Love for our own country, motivation for startups, societal connect, renewable energy, etc. are integrated appropriately in the course curriculum document.

I) CO(s) Wise Suggested Contents:

Mapped CO(s) Number	Contents
CO1 Describe Hydropower Engineering in Nepal with respect to historical context, present context and challenges of hydropower development in Nepal.	**Unit- 1.0: Introduction to Hydropower Engineering** 1.1 Energy and its sources, Present Scenario of Energy Consumption in Nepal. 1.2 Brief Historical Background of Power development in Nepal 1.3 Challenges of Hydropower Development in Nepal.
CO2 Estimate hydropower potential of Run of River Hydropower.	**Unit- 2.0: Power and Energy Potential Study** 2.1 Gross and Net Head and Estimation in case of different types of turbine. 2.2 Estimate Power and Energy Potential

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Contents
CO3 Design headworks of Run-of River plants.	**Unit- 3.0: Design of Hydropower comonents** 3.1 Design Weir/Dam 3.2 Design Intake Structure 3.3 Design Gravel trap 3.4 Design Settling basins
CO4 Design water conveyance system of Run-of River plants.	**Unit- 4.0: Water Conveyance Structures** 4.1 Design Canal 4.2 Design Tunnel 4.3 Design Forebay and Surge tank 4.4 Design Anchor Blocks and support piers
CO5 Design Powerhouse of Run-of River plants.	**Unit- 5.0: Powerhouse Design** 5.1 Apply the skill for location of powerhouse in toposheet 5.2 Design the powerhouse

J) CO(s) Wise Suggested List of Practicals:

Mapped CO(s) Number	Laboratory Experiment/ Practicals
CO1	1 ……. 2 …… 3 …….
CO2, CO3	4 …….. 5 ……. 6 …….
CO3	7 ……. 8 ……..
CO4	9 …… 10 ……. 11 ……...
CO5	12 …….. 13 …….. 14 …….

Note: Rubrics need to be prepared for effective performance by each student and their valid and reliable assessment.

Sample Course Curriculum Detailing Format

K) Suggested In Semester Activities: This may include complex engineering problems, micro projects, seminar, self-learning, industrial/ field visit, assignment etc. It reinforces the development of spectrum of abilities needed for attainment of course outcomes. Complex engineering problems and micro projects need to be provided to learners to develop the problem solving, analytical, critical thinking, creative, investigative, exploring abilities in the learners and to prepare them as future ready work force. MOOCs, spoken tutorials, online educational resources etc. may be used for Self-Learning.

a. Suggested Complex Engineering Problems:

S. No.	Suggested Complex Engineering Problems
1.	Design Weir, Dams of Run of River Hydropower plants
2.	Design water conveyance system of Run-of River plants.
3.	Design Powerhouse of Run-of River plants.
4.	
5.	

b. Suggested Micro Projects:

S. No.	Suggested Micro Projects
1.	Rehabilitation, Upgradation and Maintenance of Small Hydropower plants.
2.	
3.	
4.	
5.	

c. Suggested Seminar Topics, Self- Learning Topics, Industrial Visits/Field Demonstration/Any other relevant activity, as applicable:

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/ Field Demonstration	Any other Relevant Activity
1.				
2.				
3.				
4.				

Sample Course Curriculum Detailing Format

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/ Field Demonstration	Any other Relevant Activity
5.				

Sample Course Curriculum Detailing Format

L) Suggested Instructional/ Implementation Strategies: Different instructional/ learning/ implementation strategies may be used appropriately, as per the requirement of the level of learners and outcome to be achieved. Some of them are improved lecture, tutorial, case method, group discussion, industrial visits, industrial training, field trips, role play, live demonstrations in classrooms, lab, field, project work, self-learning, etc. Use of Information and Communications Technology (ICT) based teaching learning, blended or flipped mode, brainstorming, expert session, video clippings, Online Educational Resources (OER), MOOCs, etc. are the some of the suggestive methods/ strategies to be adopted appropriately.

The relevant instructional/ implementation strategies may be mentioned appropriately as per the requirement of CO.

CO Statement	Suggested Relevant Instructional/ Implementation Strategies	Suggested Required Resources
Estimate hydropower potential of Run of River Hydropower.	Apply the knowledge of Gross head and discharge estimation.	Topo sheet of 1:25000 scale

M) Suggested Learning Resources:

a) Books

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Fundamentals of Hydropower Engineering	Er. Sajneeb Baral	Engineering and Educational Services Pvt. Ltd.
2.	Water Power Engineering	M M Dandekar, K N Sharma	UBS Publishers Distributors Pvt. Ltd. 978-93259-6898-1
3.			
4.			

b) Online Educational Resources (OER):

1) …….
2) …….
3) …….

c) Suggested List of Equipment: (For Class Size- 30)

Sample Course Curriculum Detailing Format

S. No.	Name of the Equipment	Suggested Specifications	Remarks
1.			
2.			
3.			
4.			

N) (a) Course Curriculum Development Team (Respective Universities)

S. No.	Name and Designation	E-mail Address
1.	Dr. Shyam Sundar Khadka	sskhakda@ku.edu.np
2.	Santosh Chaudhary	santosh.chaudhary@ku.edu.np

(b) Course Curriculum Development Team (Academia & Experts)

S. No.	Name and Designation	E-mail Address
1.	Dr. Shyam Sundar Khadka	sskhakda@ku.edu.np
2.	Santosh Chaudhary	santosh.chaudhary@ku.edu.np

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Sample Course Curriculum Detailing Format

A)	**Course Title: Engineering Economics**	
B)	**Course Code:**	
C)	**Major Pre- requisite Course (s): Estimating and Valuation**	

D) Rationale:

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the attainment of following course outcomes by the learners.

Course Outcomes (COs)	Course Outcome Statements
CO1	Analyze cash flow series using time value of money
CO2	Assess project alternatives and cash flows under varying cost components.
CO3	Analyze Project Risk using Computational Tools and Monte-Carlo Simulation.
CO4	Present the evaluation of Social Cost Benefit Analysis of Public Project using UNIDO Approach.
CO5	

F) Course Articulation Matrix (CAM):

Course Outcomes (COs	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)*	
	PO1 Engineering Knowledge	**PO2** Problem Analysis	**PO3** Design/ Development of Solutions	**PO4** Investigation	**PO5** Modern Tool Usage	**PO6** The Engineer and The Society	**PO7** Ethics	**PO8** Individual and Collaborative Team Work	**PO9** Communication	**PO10** Project Management and Finance	**PO11** Life-long Learning	**PSO1**	**PSO2**
CO1		√			√					√			√
CO2		√	√		√	√	√			√			√
CO3		√	√	√	√			√		√	√		√
CO4		√	√	√		√	√	√	√	√	√		√
CO5													

Legend: High (3), Medium (2), Low (1) and No mapping (-)
Optional (*)

Sample Course Curriculum Detailing Format

G) Teaching and Examination Scheme:

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
				2	1	2	4	7	20	30	40	60	150

Legend:
L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical
Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Core Elective (PCE), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

H) Course Curriculum Detailing: For attainment of course outcomes, the students are expected to perform/ undergo various activities through classroom, laboratories, workshops, tutorials, micro project, assignments, field sessions, self- learning assignment etc.
Unique features like green skills, SDGs, multidisciplinary aspects, Love for our own country, motivation for startups, societal connect, renewable energy, etc. are integrated appropriately in the course curriculum document.

I) CO(s) Wise Suggested Contents:

Mapped CO(s) Number	Contents
CO1,	**Unit- 1.0: Value Engineering** 1.1 Project Cash Flows. 1.1.1 Time Value of Money (P/F, F/P, A/P,P/A, F/A, A/F) 1.1.2 Cash Flow Diagram to represent Project Cash Flows. 1.2 Capital Investment Criteria 1.2.1 Single Projects 1.2.2 Multiple Projects 1.2.3 Dependent and Independent Projects 1.2.4 Ranking of Projects 1.2.5 conflicts in ranking projects
CO2	**Unit- 2.0: Components of Cash Flow** 2.1 Financial Analysis 2.1.1 Financial Statements 2.1.2 Financial Ratios

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Contents
	2.2 Elements of Cash Flow 2.2.1 Depreciation 2.2.2 Inflation 2.2.3 Income Tax and Tax Laws 2.3 Effects of Cash flow components on Cash flows 2.4 Case Study
CO3	**Unit- 3.0: Project Risk And Uncertainty** 3.1 Risk Management 3.1.1 Origin and Identification of Risks 3.1.2 Statistical Approaches to Risk Management 3.1.3 Risk Mitigation and Contingency Plan 3.1.4 Time Series Analysis 3.2 Risk Analysis using Machine Learning 3.2.1 Sensitivity Analysis 3.2.2 Scenario Analysis 3.2.3 Simulation Analysis using Monte Carlo Simulation (Crystal Ball or python) 3.2.4 Decision Tree Analysis 3.3 Case Study
CO 4	**Unit- 4.0: Evaluation of Social Projects** 4.1 Economic Principles 4.1.1 Micro and Macro Economic 4.1.2. Law of Supply and Demand 4.1.3 Keynesian Economics, Financial and Monetary Policy 4.2 Social Cost Benefit Analysis 4.1.1 Effect of Externalities 4.1.2. Market Imperfections 4.1.3 Equity and Redistribution 4.3 UNIDO Approach 4.4 Case Study
CO1, CO2, CO3, CO4	**Unit- 5.0: Course Project**

J) CO(s) Wise Suggested List of Practicals:

Mapped CO(s) Number	Laboratory Experiment/ Practicals
CO1	1 ……. 2 …… 3 …….
CO2, CO3	4 …….. 5 …….

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Laboratory Experiment/ Practicals
	6 …….
CO3	7 ……. 8 ……..
CO4	9 …… 10 ……. 11 ……..
CO5	12 …….. 13 …….. 14 …….

Note: Rubrics need to be prepared for effective performance by each student and their valid and reliable assessment.

K) Suggested In Semester Activities: This may include complex engineering problems, micro projects, seminar, self-learning, industrial/ field visit, assignment etc. It reinforces the development of spectrum of abilities needed for attainment of course outcomes. Complex engineering problems and micro projects need to be provided to learners to develop the problem solving, analytical, critical thinking, creative, investigative, exploring abilities in the learners and to prepare them as future ready work force. MOOCs, spoken tutorials, online educational resources etc. may be used for Self-Learning.

a. Suggested Complex Engineering Problems:

S. No.	Suggested Complex Engineering Problems
1.	
2.	
3.	
4.	
5.	

b. Suggested Micro Projects:

S. No.	Suggested Micro Projects
1.	
2.	

Sample Course Curriculum Detailing Format

S. No.	Suggested Micro Projects
3.	
4.	
5.	

c. Suggested Seminar Topics, Self- Learning Topics, Industrial Visits/Field Demonstration/Any other relevant activity, as applicable:

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/ Field Demonstration	Any other Relevant Activity
1.				
2.				
3.				
4.				
5.				

Sample Course Curriculum Detailing Format

L) Suggested Instructional/ Implementation Strategies: Different instructional/ learning/ implementation strategies may be used appropriately, as per the requirement of the level of learners and outcome to be achieved. Some of them are improved lecture, tutorial, case method, group discussion, industrial visits, industrial training, field trips, role play, live demonstrations in classrooms, lab, field, project work, self-learning, etc. Use of Information and Communications Technology (ICT) based teaching learning, blended or flipped mode, brainstorming, expert session, video clippings, Online Educational Resources (OER), MOOCs, etc. are the some of the suggestive methods/ strategies to be adopted appropriately.

The relevant instructional/ implementation strategies may be mentioned appropriately as per the requirement of CO.

CO Statement	Suggested Relevant Instructional/ Implementation Strategies	Suggested Required Resources

M) Suggested Learning Resources:

a) Books

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Contemporary Engineering Economics	Chan S. Park	Prentice Hall of India, New Delhi,
2.	Principle of Micro economics	G. Mankiw	
3.	Principle of Macro economics	G Mankiw	
4.	Financial Management	I M Pandey	

b) Online Educational Resources (OER):

1) …….
2) …….
3) …….

c) Suggested List of Equipment: (For Class Size- 30)

S. No.	Name of the Equipment	Suggested Specifications	Remarks
1.			

Sample Course Curriculum Detailing Format

S. No.	Name of the Equipment	Suggested Specifications	Remarks
2.			
3.			
4.			

N) (a) Course Curriculum Development Team (Respective Universities)

S. No.	Name and Designation	E-mail Address
1.		
2.		

(b) Course Curriculum Development Team (Academia & Experts)

S. No.	Name and Designation	E-mail Address
1.		
2.		

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Sample Course Curriculum Detailing Format

A)	**Course Title: Tunnel Engineering**
B)	**Course Code: BCE 460**
C)	**Major Pre- requisite Course (s):**

D) Rationale:

Tunnel Engineering course that equips civil engineering students with a systematic understanding of the principles, planning, design, construction, safety, and maintenance of tunnels across diverse geological and operational settings. The course progresses logically from tunnel fundamentals and geological investigation, through structural design and support systems, construction methods and safety systems, to maintenance strategies and emerging digital technologies. The course gives particular attention to Nepal's Himalayan and Terai geological settings, drawing on national road, hydropower, and water conveyance tunnel projects.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the attainment of following course outcomes by the learners.

Course Outcomes (COs)	Course Outcome Statements
CO 1	Explain the fundamental concepts, classification, components, and significance of tunnel engineering, with reference to major tunnel projects in Nepal
CO 2	Describe the geological investigation of tunnel.
CO 3	Design tunnel alignment, based on support systems and lining methods for stable and efficient tunnel construction.
CO 4	Select the appropriate method (like drill-and-blast, NATM and TBM) for given geological risks, construction speed, and project costs.
CO 5	Apply engineering methods for tunnel safety systems including ventilation, drainage, leakage control, and quality monitoring to ensure safe construction and operational performance of tunnels.
CO 6	Develop a tunnel maintenance and management plan by integrating inspection strategies, ground improvement methods, and emerging digital technologies for sustainable tunnel lifecycle management

F) Course Articulation Matrix (CAM):

	Programme Outcomes (POs)	Programme Specific Outcomes (PSOs)*

Sample Course Curriculum Detailing Format

Course Outcomes (COs	PO1 Engineering Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Investigation	PO5 Modern Tool Usage	PO6 The Engineer and The Society	PO7 Ethics	PO8 Individual and Collaborative Team Work	PO9 Communi cation	PO10 Project Management and Finance	PO11 Life-long Learning	PSO1	PSO2
CO1	3	1	-	-	-	2	-	-	2	-	1		
CO2	3	3	-	2	2	1	-	-	-	-	-		
CO3	2	3	3	2	2	-	-	-	-	1	-		
CO4	2	3	3	2	2	-	-	-	-	2	-		
CO5	2	1	1	2	2	3	-	2	-	-	-		
CO6	1	1	2	2	3	-	-	2	-	-	2		

Legend: High (3), Medium (2), Low (1) and No mapping (-)
Optional (*)

G) Teaching and Examination Scheme:

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	BCE 480	**PCC**	**Tunnel Engineering**	**3**	**3**	**2**	**0**	**80**	**60**	**40**			**100**

Legend:
L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical
Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Core Elective (PCE), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

H) Course Curriculum Detailing: For attainment of course outcomes, the students are expected to perform/ undergo various activities through classroom, laboratories, workshops, tutorials, micro project, assignments, field sessions, self- learning assignment etc.
Unique features like green skills, SDGs, multidisciplinary aspects, Love for our own country, motivation for startups, societal connect, renewable energy, etc. are integrated appropriately in the course curriculum document.

I) CO(s) Wise Suggested Contents:

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Contents
CO- 1 Explain the fundamental concepts, classification, components, and significance of tunnel engineering, with reference to major tunnel projects in Nepal.	**Unit 1: Introduction to Tunnel Engineering (4 hrs)** 1.1 Definition, scope, and needs for tunnel in civil engineering 1.2 Historical development of tunnel in Nepal: evolution from ancient to modern tunnels 1.3 Application of tunnel: transportation, water conveyance, hydropower, mining and urban tunnels 1.4 Components of tunnel: portal, crown, invert, wall, springline, face, lining, etc. 1.5 Classification based on purpose, location, and construction method, Tunnel geometry and geology. 1.6 Tunnel projects in Nepal: road tunnels (Nagdhunga, Siddhababa), hydropower tunnels, water conveyance
CO-2 Describe the geological investigation of tunnel.	**Unit 2: Geological Investigation for Tunnel** 2.1Geological considerations: soil/rock stability, seismic tectonics, landslides, and monsoon hydrology challenges 2.2 Site investigation methods: Drilling, geophysical surveys, laboratory and field-testing procedures 2.3 Geological hazards in Nepal: faults, folds, weak zones, ground water condition and gas emissions 2.4 Rock mass classification system: Rock Mass Rating (RMR), Q-system
CO-3 Design tunnel alignment, based on support systems and lining methods for stable and efficient tunnel construction.	**Unit 3: Tunnel Design and Support System** 3.1 Tunnel alignment: horizontal and vertical alignment, Factors affecting alignment selection 3.2 Design Principles: Circular and non-circular tunnels, stress distribution around tunnels, failure mechanisms 3.3 Support system: need for support, types of support system (Rock bolts, shotcrete, steel sets and concrete) 3.4 Tunnel lining: Need for lining, lining material and procedure 3.5 Final lining system: cast-in-place concrete, precast concrete segment.
CO-4 Select the appropriate method (like drill-and-blast, NATM and TBM) for given geological risks, construction speed, and project costs.	**Unit 4: Methods of Tunnel Construction** 4.1 Introduction of tunnel construction methods and practise available for both soft and hard rock. 4.2 Conventional tunneling: drill-and-blast method (drill, charge, muck, support) 4.3 New Austrian Tunnelling Method (NATM): principles, excavation sequences (top heading, bench, invert), shotcrete application, immediate monitoring response 4.4 Mechanized tunnelling: Tunnel Boring Machines (TBM) type (open, single-shield, double-shield, and slurry shield), TBM selection, construction procedure, installation, disassembly or reuse 4.5 Cut-and-cover method: top-down and bottom-up procedures,

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Contents
	temporary retaining structures, selection criteria for urban tunnels 4.6 Comparison of methods: cost, speed, ground loss, applicability in Nepal's geological settings 4.7 Problems and remedial measures: face instability, rock bursts, squeezing, water inflows, and surface settlements.
CO5-. Apply engineering methods for tunnel safety systems including ventilation, drainage, leakage control, and quality monitoring to ensure safe construction and operational performance of tunnels	**Unit 5: Tunnel Safety and Operation** 5.1 Ventilation requirements: air quality standards, ventilation systems (longitudinal, transverse, semi-transverse) 5.2 Tunnel lighting for construction stage and operation stage 5.3 Safety in construction: confined space entry procedures, gas monitoring, emergency response plans, fire safety, dust and fume control 5.4 Drainage and water control: during construction (dewatering, grouting), in permanent tunnels (drainage blanket, collector drains, pump sumps) 5.5 Leakage sealing techniques: polyurethane injection, chemical grouting, cement grouting, crack injection (Epoxy/Polyurethane), crystalline waterproofing 5.6 Quality control: concrete lining cube tests, shotcrete rebound, pull-out tests for rock bolts 5.7 Concept of instrumentation and monitoring: settlement points, piezometers
CO -6 Develop a tunnel maintenance and management plan by integrating inspection strategies, ground improvement methods, and emerging digital technologies for sustainable tunnel lifecycle management	**Unit 6: Maintenance and Emerging issues in Construction** 6.1 Overview of maintenance: definition, need, lifecycle approach, and maintenance planning in tunnel management. 6.2 Tunnel inspection: visual assessment (crack maps, spalling, efflorescence), periodic and principle inspections. 6.3 Maintenance strategies: preventive (regular cleaning, joint resealing), corrective (crack injection, re-lining, drainage repair), predictive (sensor-based health monitoring) 6.4 Environmental impacts and mitigation in tunnel project 6.5 Grouting and ground improvement methods: permeation, compaction, and jet grouting, Deep soil mixing, and vibro-flotation. 6.6 Application of drones and robotic in tunnel construction 6.7 Opportunities and challenges of emerging technology in tunnel project in the Nepal context.

J) CO(s) Wise Suggested List of Practicals:

Mapped CO(s) Number	Laboratory Experiment/ Practicals
CO1	1 ……. 2 …… 3 …….

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Laboratory Experiment/ Practicals
CO2, CO3	4 …….. 5 ……. 6 …….
CO3	7 ……. 8 …….
CO4	9 …… 10 ……. 11 ……...
CO5	12 …….. 13 …….. 14 …….

Note: Rubrics need to be prepared for effective performance by each student and their valid and reliable assessment.

K) Suggested In Semester Activities: This may include complex engineering problems, micro projects, seminar, self-learning, industrial/ field visit, assignment etc. It reinforces the development of spectrum of abilities needed for attainment of course outcomes. Complex engineering problems and micro projects need to be provided to learners to develop the problem solving, analytical, critical thinking, creative, investigative, exploring abilities in the learners and to prepare them as future ready work force. MOOCs, spoken tutorials, online educational resources etc. may be used for Self-Learning.

a. Suggested Complex Engineering Problems:

S. No.	Suggested Complex Engineering Problems
1.	Formulate a life-cycle maintenance programme for an ageing hydropower headrace tunnel showing significant concrete lining deterioration and seepage — include NDE inspection methods, priority repair schedule, and lifecycle cost estimate.
2.	Design a cost-optimised tunnel alignment for the proposed Kathmandu–Nuwakot road connection through the Mahabharat Range, considering geological hazards, hydropower right-of-way, and seismic loading.

b. Suggested Micro Projects:

S. No.	Suggested Micro Projects
1.	Conduct a comparative case study of Nagdhunga and Siddhababa road tunnels in Nepal covering construction methods, challenges, and lessons learned.
2.	Prepare a maintenance checklist using visual inspection.

Sample Course Curriculum Detailing Format

c. Suggested Seminar Topics, Self- Learning Topics, Industrial Visits/Field Demonstration/Any other relevant activity, as applicable:

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/ Field Demonstration	Any other Relevant Activity
1.	Numerical methods in tunnel design (FEM) or PLAXIS software demonstration	Emerging waterproofing technologies: crystalline admixtures and HDPE membranes	Site visit: Nagdhunga Tunnel and siddhababa Tunnel, (observe portal, lining, drainage, ventilation and construction methods)	Submit a one-page reflective report after field visit
2.	Challenges and risks in tunnel projects in Nepal: navigates geology, high costs and community opposition.	Case-based learning using real-world case studies to identify best practices and lessons learned in tunnel construction projects.	Industrial visit: Ready-mix concrete plant supplying tunnel lining works.	Group debate: TBM vs. drill-and-blast for Himalayan conditions

Sample Course Curriculum Detailing Format

L) Suggested Instructional/ Implementation Strategies: Different instructional/ learning/ implementation strategies may be used appropriately, as per the requirement of the level of learners and outcome to be achieved. Some of them are improved lecture, tutorial, case method, group discussion, industrial visits, industrial training, field trips, role play, live demonstrations in classrooms, lab, field, project work, self-learning, etc. Use of Information and Communications Technology (ICT) based teaching learning, blended or flipped mode, brainstorming, expert session, video clippings, Online Educational Resources (OER), MOOCs, etc. are the some of the suggestive methods/ strategies to be adopted appropriately.

The relevant instructional/ implementation strategies may be mentioned appropriately as per the requirement of CO.

CO Statement	Suggested Relevant Instructional/ Implementation Strategies	Suggested Required Resources
CO1	Improved lecture with multimedia; documentary video screening (Nagdhunga Tunnel construction); virtual tour of tunnel portals	Projector, internet, case-study handouts, maps of Nepal tunnel projects
CO2	Hands-on rock core logging; group exercises on RMR/Q calculation; guest lecture by a geotechnical engineer from a consulting firm	Rock core samples, borehole logs, field mapping forms, RMR/Q worksheets
CO3	Problem-based learning: design problems with real Nepal geology data; PLAXIS 2D software demonstration; Convergence-Confinement Method tutorial	Design standards, /PLAXIS software, drawing instruments
CO4	Case-method teaching (Siddhababa Tunnel vs. Nagdhunga; video case studies; comparative cost–schedule table construction by student teams; field visit to an active tunnel site	Construction method videos, cost data sheets, site visit arrangement
CO5	Scenario-based role play (emergency response); laboratory simulation of monitoring data plotting; ICT-based blended session using MOODLE; real datasets from Melamchi monitoring	Monitoring instruments, Excel/Python worksheets, safety standards
CO6	Drone footage review and discussion; expert session from	Drone videos, NDE equipment brochures,

Sample Course Curriculum Detailing Format

CO Statement	Suggested Relevant Instructional/ Implementation Strategies	Suggested Required Resources
	TBM/drone technology firm; student team project to develop a maintenance plan; SDG integration activity	BIM software demo, SDG poster templates

M) Suggested Learning Resources:

a) Books

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Tunnel Engineering Handbook	Bickel J.O., Kuesel T.R., King E.H.	Chapman & Hall, 2nd Ed., 1996; ISBN 978-0412992810
2.	Underground Excavations in Rock	Hoek E., Brown E.T.	Institution of Mining and Metallurgy, London, 1980; ISBN 978-0900488559
3.			
4.			

b) Online Educational Resources (OER):

1) US FHWA Tunnel Engineering Reference Manual: https://www.fhwa.dot.gov
2) …….
3) …….

c) Suggested List of Equipment: (For Class Size- 30)

S. No.	Name of the Equipment	Suggested Specifications	Remarks
1.			
2.			
3.			
4.			

N) (a) Course Curriculum Development Team (Respective Universities)

S. No.	Name and Designation	E-mail Address
1.		
2.		

Sample Course Curriculum Detailing Format

(b) Course Curriculum Development Team (Academia & Experts)

S. No.	Name and Designation	E-mail Address
1.		
2.		

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Sample Course Curriculum Detailing Format

A)	**Course Title:** Civil Engineering Material
B)	**Course Code:** CE 1204
C)	**Major Pre- requisite Course (s):**

D) Rationale:

This course introduces the fundamental materials used in civil engineering construction and their properties, manufacturing processes, testing methods, and applications. It covers traditional construction materials such as stone, brick, timber, cement, tiles as well as metals, finishing materials, blocks and modern construction materials. The course also emphasizes material selection, quality control, durability, and sustainable construction practices, including recycled materials and green building concepts. By the end of the course, students will understand how different materials influence the performance, safety, and sustainability of civil engineering structures.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the attainment of following course outcomes by the learners.

Course Outcomes (COs)	Course Outcome Statements
CO1	Apply the methods of dressing and finishing of stones for construction purposes.
CO2	Analyze the manufacture, classification, properties, testing, and applications of bricks, blocks, and tiles used in construction engineering.
CO3	Evaluate the properties, testing, preservation, seasoning, and applications of timber and timber products used in construction engineering.
CO4	Assess the types, manufacture, properties, testing, grades, and applications of cement, admixtures, and mortar used in construction engineering.
CO5	Evaluate the properties, composition, corrosion behavior, and applications of metals and alloys, including reinforcing and structural steel.
CO6	Identify sustainable and innovative construction materials and their applications in modern infrastructure development.

F) Course Articulation Matrix (CAM):

Course Outcomes (COs	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)*	
	PO1 Engineering Knowledge	**PO2** Problem Analysis	**PO3** Design/ Development of Solutions	**PO4** Investigation	**PO5** Modern Tool Usage	**PO6** The Engineer and The Society	**PO7** Ethics	**PO8** Individual and Collaborative Team Work	**PO9** Communication	**PO10** Project Management and Finance	**PO11** Life-long Learning	**PSO1**	**PSO2**
CO1	3	2	1	-	-	1	1	-	-	-	1		
CO2	3	3	2	2	1	1	1	-	-	-	1		

Sample Course Curriculum Detailing Format

CO3	3	2	2	2	-	1	1	-	-	-	1		
CO4	3	3	2	2	1	1	1	-	-	-	1		
CO5	3	3	2	2	1	1	1	-	-	-	1		
CO6	3	2	3	1	1	3	2	1	1	1	2		

Legend: High (3), Medium (2), Low (1) and No mapping (-)
Optional (*)

G) Teaching and Examination Scheme:

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	CE 1204	**PCC**	**Construction Materials**	3	3	0	1.5	4.5	40	60	10	15	125

Legend:
L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical
Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Core Elective (PCE), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

H) Course Curriculum Detailing:

For attainment of course outcomes, the students are expected to perform/ undergo various activities through classroom, laboratories, workshops, tutorials, micro project, assignments, field sessions, self- learning assignment etc.

Unique features like green skills, SDGs, multidisciplinary aspects, Love for our own country, motivation for startups, societal connect, renewable energy, etc. are integrated appropriately in the course curriculum document.

I) CO(s) Wise Suggested Contents:

Mapped CO(s) Number	Contents
CO1: Apply the methods of dressing and finishing of stones for construction purposes.	**UNIT 1. Building Stones** **1.1.** Introduction **1.2.** Types of building stones and their uses **1.3.** Quality of good building stones **1.4.** Test for stones **1.5.** Deterioration of stones **1.6.** Preservation of stones

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Contents
	1.7. Dressing of stones
CO2: Analyze the manufacture, classification, properties, testing, and applications of bricks, blocks, and tiles used in construction engineering.	**UNIT 2. Brick, Blocks and Tiles** **2.1** Introduction to Bricks, Blocks and Tiles **2.2** Manufacture, Classification and Tests of Bricks **2.3** Types of Blocks (Solid, Hollow, CSEB, AAC and Fly Ash) **2.4** Properties, Uses, Advantages and Limitations of Blocks **2.5** Tiles: Types, Quality and Uses
CO3: Evaluate the properties, testing, preservation, seasoning, and applications of timber and timber products used in construction engineering.	**Unit 3: Timber** 3.1. Characteristics of good timber 3.2 Types of Timber and common timber species used in Nepal. 3.3. Tests for good Timber 3.4. Deterioration and Preservation of Timber 3.5. Seasoning of timber 3.6. Commercial Products of timber & their uses
CO4: Assess the types, manufacture, properties, testing, grades, and applications of cement, admixtures, and mortar used in construction engineering.	**Unit 4: Cement** 4.1. Cementing materials and their types (clay, lime, cement, etc.) 4.2. Type, Properties, and uses of cement 4.3. Ingredients of Cement 4.4. Manufacture of an Ordinary Cement (Flow Diagram) 4.5. Chemical Composition and Hydration of Ordinary Cement 4.6. Laboratory tests for cement 4.7. Grades of cement 4.8. Admixtures 4.9. Mortar and its types
CO5: Evaluate the properties, composition, corrosion behavior, and applications of metals and alloys, including reinforcing and structural steel.	**Unit 5: Metals and Alloys** 5.1. Introduction 5.2. Type, Properties, and Uses of Iron 5.3. Reinforcing steel grades and standards 5.4. Structural steel sections and applications 5.5. Corrosion of steel and protection methods 5.6. Composition and Properties of Steel 5.7. Heat Treatment Process 5.8. Alloy of Steel 5.9. Non-ferrous Metals 5.10. Commercial product of Metals
CO6: Identify sustainable and innovative construction materials and	**Unit 6 Advanced sustainable and Miscellaneous Construction Materials** 6.1. Types, Properties, and Applications of Glasses in Construction 6.3. Types of Plastics (Thermoplastics and

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Contents
their applications in modern infrastructure development.	Thermosetting Plastics) 6.5. Uses of plastics in Construction: Pipes (PVC, HDPE), Doors and Windows (UPVC), Flooring and Sheets, Insulation Materials and Waterproofing Membranes 6.6. Geosynthetics (Geotextiles, Geomembranes, Geogrids) and application in modern engineering construction. 6.8. Function, ingredient, Type and Uses of Paint and Varnishes 6.9. Distemper and its importances 6.10.. Recycled and reused construction materials 6.11. Geopolymer Concrete: Concept, constituent materials, properties, and applications 6.12. Fiber Reinforced Concrete (FRC): types of fibers, properties, and uses 6.13. Modular and Prefabricated Construction: Types of Materials, Advantages and Applications in modern construction.

J) CO(s) Wise Suggested List of Practicals:

Mapped CO(s) Number	Laboratory Experiment/ Practicals
CO7: The students will be able to perform laboratory experiments related to the physical and mechanical properties of construction materials for engineering applications.	1. Specific Gravity and Water Absorption Test of Aggregates 2. Sieve Analysis of Fine and Coarse Aggregates 3. Bulking of Sand Test 4. Standard Consistency Test of Cement (Using Vicat Apparatus) 5. Initial and Final Setting Time Test of Cement 6. Fineness Test of Cement 7. Soundness Test of Cement 8. Compressive Strength test of brick

Note: Rubrics need to be prepared for effective performance by each student and their valid and reliable assessment.

K) Suggested In Semester Activities: This may include complex engineering problems, micro projects, seminar, self-learning, industrial/ field visit, assignment etc. It reinforces the development of spectrum of abilities needed for attainment of course outcomes. Complex engineering problems and micro projects need to be provided to learners to develop the problem solving, analytical, critical thinking, creative, investigative, exploring abilities in the learners and to prepare them as future ready work force. MOOCs, spoken tutorials, online educational resources etc. may be used for Self-Learning.

Sample Course Curriculum Detailing Format

a. Suggested Complex Engineering Problems:

S. No.	Suggested Complex Engineering Problems
1.	Selection of suitable construction materials for different environmental conditions
2.	Comparative analysis of traditional vs sustainable materials for a specific infrastructure project.

b. Suggested Micro Projects:

S. No.	Suggested Micro Projects
1.	Micro project: Study on performance comparison of AAC blocks, fly ash bricks, and conventional bricks.
2.	Preparation and testing of CSEB blocks using locally available soil materials
3.	Development of a low-cost concrete mix design using recycled aggregates or industrial waste.

c. Suggested Seminar Topics, Self- Learning Topics, Industrial Visits/Field Demonstration/Any other relevant activity, as applicable:

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/ Field Demonstration	Any other Relevant Activity
1.	Seminar / Presentation: Use of recycled materials in infrastructure development.	-Online courses on sustainable construction materials and green building technologies.	One-day field visit to local construction sites and material suppliers, enabling students to observe, identify, and understand the properties, availability, and practical handling of commonly used construction materials.	
2.		-Video demonstrations on material testing procedures.		
3.		-IS/NBC standards related to construction materials.		

Sample Course Curriculum Detailing Format

L) Suggested Instructional/ Implementation Strategies: Different instructional/ learning/ implementation strategies may be used appropriately, as per the requirement of the level of learners and outcome to be achieved. Some of them are improved lecture, tutorial, case method, group discussion, industrial visits, industrial training, field trips, role play, live demonstrations in classrooms, lab, field, project work, self-learning, etc. Use of Information and Communications Technology (ICT) based teaching learning, blended or flipped mode, brainstorming, expert session, video clippings, Online Educational Resources (OER), MOOCs, etc. are the some of the suggestive methods/ strategies to be adopted appropriately.

The relevant instructional/ implementation strategies may be mentioned appropriately as per the requirement of CO.

CO Statement	Suggested Relevant Instructional/ Implementation Strategies	Suggested Required Resources
CO1: Apply the methods of dressing and finishing of stones for construction purposes.	- Lecture method with case studies -Problem-based learning - Laboratory testing of materials and quality control (stones, bricks, cement, timber) - Field visit to material production industries	Human Resource ICT/ Multimedia
CO2: Analyse the manufacture, classification, properties, testing, and applications of bricks, blocks, and tiles used in construction engineering.	- Lecture method with case studies -Project-based learning related to CSEB, recycled materials, geopolymer concrete. - Seminar presentations on sustainable materials - ICT-based learning - Field visit to material production industries	Human Resource ICT/ Multimedia
CO3: Evaluate the properties, testing, preservation, seasoning, and applications of timber and timber products used in construction engineering.	-Interactive lectures with real-life engineering examples. -Problem based learning on corrosion and material failure - Field visit to material production industries. - ICT-based learning	Laboratory Set Up Human Resource ICT/ Multimedia
CO4: Assess the types, manufacture, properties, testing, grades, and applications of cement, admixtures, and mortar used in construction engineering.	-Interactive lectures -ICT-based learning -Laboratory testing of steel and metals.	Laboratory Set Up Human Resource ICT/ Multimedia

Sample Course Curriculum Detailing Format

CO Statement	Suggested Relevant Instructional/ Implementation Strategies	Suggested Required Resources
CO5: Evaluate the properties, composition, corrosion behaviour, and applications of metals and alloys, including reinforcing and structural steel.	-Interactive lectures -Laboratory testing of steel and metals. -Case study analysis of structural failures - Field visit to material production industries.	
CO6: Identify sustainable and innovative construction materials and their applications in modern infrastructure development.	- Group discussion on green building concepts -Case Study	

M) Suggested Learning Resources:

a) Books

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Engineering materials.	Rangawala, S. C. (2015.).	Charotar Publishing House, India
2.	Fundamentals of engineering materials.	Thornton, P. A., & Colangelo, V. J. (1985).	Prentice Hall.
3.	Engineering materials. .	Kumar, S. (2021).	Standard Publication and Distributors
4.	Engineering material.	Rajput, R. K. (2004).	S. Chand & Company Ltd.
5.	Civil engineering material.	Singh, P. (2008).	Katson Books.
6.	Material science and processes.	Khurmi, R. S., & Sedha, R. S. (2008).	S. Chand & Company Ltd.

b) Online Educational Resources (OER):

1) …….
2) …….
3) …….

c) Suggested List of Equipment: (For Class Size- 30)

S. No.	Name of the Equipment	Suggested Specifications	Remarks
1.	Vicat Apparatus (cement consistency and setting time)	Relevant Indian Standard Codes	

Sample Course Curriculum Detailing Format

S. No.	Name of the Equipment	Suggested Specifications	Remarks
2.			
3.			
4.			

N) (a) Course Curriculum Development Team (Respective Universities)

S. No.	Name and Designation	E-mail Address
1.		
2.		

(b) Course Curriculum Development Team (Academia & Experts)

S. No.	Name and Designation	E-mail Address
1.		
2.		

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Sample Course Curriculum Detailing Format

A)	**Course Title:**Civil Engineering Material	
B)	**Course Code:**BCE116	
C)	**Major Pre- requisite Course (s):**	

D) Rationale:

This course introduces the fundamental materials used in civil engineering construction and their properties, manufacturing processes, testing methods, and applications. It covers traditional construction materials such as stone, brick, timber, cement, tiles as well as metals, finishing materials, blocks and modern construction materials. The course also emphasizes material selection, quality control, durability, and sustainable construction practices, including recycled materials and green building concepts. By the end of the course, students will understand how different materials influence the performance, safety, and sustainability of civil engineering structures.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the attainment of following course outcomes by the learners.

Course Outcomes (COs)	Course Outcome Statements
CO1	Explain the classification, properties, and behavior of construction materials used in civil engineering.
CO2	Evaluate stones, aggregates, clay products, timber, metals, and bituminous materials for engineering applications.
CO3	Perform laboratory tests on construction materials and interpret test results according to standards.
CO4	Select suitable construction materials considering strength, durability, economy, and sustainability.
CO5	Apply engineering knowledge to solve practical material selection and quality control problems.
CO6	Identify sustainable and innovative construction materials and their applications in modern infrastructure development.

F) Course Articulation Matrix (CAM):

	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)*	
CourseOutcomes(COs	**PO1** Engineering Knowledge	**PO2** Problem Analysis	**PO3** Design/ Development of Solutions	**PO4** Investigation	**PO5** Modern Tool Usage	**PO6** The Engineer and The Society	**PO7** Ethics	**PO8** Individual and Collaborative Team Work	**PO9** Communication	**PO10** Project Management and Finance	**PO11** Life-long Learning	**PSO1**	**PSO2**
CO1	3	2		-	-	1	1	-	1	1	1		
CO2	3	3	2	2	1	1	1	-	-	-	1		

Sample Course Curriculum Detailing Format

CO3	2	2	-	3	2	1	-	1	-	-	1		
CO4	2	2	-	1	1	1	1	-	1	-	1		
CO5	3	3	2	2	-	1	1	-	1	-	2		
CO6	3	2	3	1	1	3	2	1	1	1	2		

Legend: High(3),Medium (2),Low(1)andNomapping(-)
Optional (*)

G) Teaching and Examination Scheme:

Board of Studies	Course Code	Course Category	CourseTitles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme(Marks)				TotalMarks
					L	T	P	Total Hours (L+T+P)	Theory		Practical		
									ISA	ESA	ISA	ESA	
	BCE116	PCC	**Construction Materials**	3	3	0	2	5	40	60	25	0	125

Legend:
L:Lecture, T: Tutorial, P:Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA:End Semester Assessment for theory and practical
Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Core Elective (PCE), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

H) Course Curriculum Detailing:

For attainment of course outcomes, the students are expected toperform/ undergo various activities through classroom, laboratories, workshops, tutorials, micro project,assignments, field sessions, self-learning assignment etc.
Unique features like green skills,SDGs,multidisciplinaryaspects, Love for our own country, motivation for startups, societalconnect,renewableenergy, etc. are integratedappropriately in the course curriculum document.

I) CO(s) Wise Suggested Contents:

Mapped CO(s) Number	Contents
CO1: CO2, CO3	**UNIT 1. Building Stones / Aggregates** **1.1.** Introduction **1.2.** Types of building stones and their uses **1.3.** Quality of good building stones **1.4.** Test for stones **1.5.** Dressing of stones / seasoning **1.6.** Deterioration of stones **1.7.** Preservation of stones

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Contents
CO1, CO2, CO3	**UNIT 2. Brick, Blocks and Tiles** **2.1** Introduction to Bricks, Blocks and Tiles **2.2** Manufacture, Classification and Tests of Bricks **2.3** Types of Blocks (Solid, Hollow, CSEB, AAC and Fly Ash) **2.4** Properties, Uses, Advantages and Limitations of Blocks **2.5** Tiles: Types, Quality and Uses
CO1, CO2, CO3	**Unit 3: Timber** 3.1. Characteristics of good timber 3.2 Types of Timber and common timber species used in Nepal. 3.3. Tests for good Timber 3.4. Deterioration and Preservation of Timber 3.5. Seasoning of timber 3.6. Commercial Products of timber & their uses 3.7. Measurement process of Timber
CO1, CO2, CO3,CO4	**Unit 4: Cement** 4.1. Cementing materials and their types (clay, lime, cement, etc.) 4.2. Type, Properties, and uses of cement 4.3. Ingredients of Cement 4.4. Manufacture of an Ordinary Cement (Flow Diagram) 4.5. Chemical Composition and Hydration of Ordinary Cement 4.6. Laboratory tests for cement 4.7. Grades of cement 4.8. Admixtures 4.9. Mortar and its types
CO1, CO2, CO3, Co4,CO5	**Unit 5: Metals and Alloys** 5.1. Introduction 5.2. Type, Properties, and Uses of Iron 5.3. Reinforcing steel grades and standards 5.4. Structural steel sections and applications 5.5. Corrosion of steel and protection methods 5.6. Composition and Properties of Steel 5.7. Heat Treatment Process 5.8. Alloy of Steel 5.9. Non-ferrous Metals 5.10. Commercial product of Metals
CO1, CO2, CO3, Co4,CO5, CO6	**Unit 6Advanced sustainable and Miscellaneous Construction Materials** 6.1. Types, Properties, and Applications of Glasses in Construction

Sample Course Curriculum Detailing Format

Mapped CO(s) Number	Contents
	6.3. Types of Plastics (Thermoplastics and Thermosetting Plastics) 6.5. Uses of plastics in Construction: Pipes (PVC, HDPE), Doors and Windows (UPVC), Flooring and Sheets, Insulation Materials and Waterproofing Membranes 6.6. Geosynthetics (Geotextiles, Geomembranes, Geogrids) and application in modern engineering construction. 6.8. Function, ingredient, Type and Uses of Paint and Varnishes 6.9. Distemper and its importances 6.10.. Recycled and reused construction materials 6.11. Geopolymer Concrete: Concept, constituent materials, properties, and applications 6.12. Fiber Reinforced Concrete (FRC): types of fibers, properties, and uses 6.13. Modular and Prefabricated Construction: Types of Materials, Advantages and Applications in modern construction.

J) CO(s)Wise Suggested List of Practicals:

Mapped CO(s) Number	Laboratory Experiment/ Practicals
CO7: The students will be able to perform laboratory experiments related to the physical and mechanical properties of construction materials for engineering applications.	1. Brick compressive strength test 2. Water absorption test on bricks 3. Sieve Analysis of Fine and Coarse Aggregte 4. Standard Consistency Test of Cement (Using Vicat Apparatus) 5. Initial and Final Setting Time Test of Cement 6. Fineness Test of Cement 7. Soundness Test of Cement 8. Toughness test of metals

Note: Rubrics need to be prepared foreffective performance by each student and their valid and reliable assessment.

K) Suggested In Semester Activities: This may include complex engineering problems, micro projects, seminar, self-learning, industrial/ field visit, assignment etc. It reinforces the development of spectrum of abilities needed for attainment of course outcomes. Complex engineering problems and micro projects need to be provided to learners to develop the problem solving, analytical, critical thinking, creative, investigative, exploring abilities in the learners and to prepare them as future ready work force.MOOCs, spoken tutorials, online educational resources etc. may be used for Self-Learning.

Sample Course Curriculum Detailing Format

a. Suggested Complex Engineering Problems:

S. No.	Suggested Complex Engineering Problems
1.	Selection of suitable construction materials for different environmental conditions
2.	Comparative analysis of traditional vs sustainable materials for a specific infrastructure project.

b. Suggested Micro Projects:

S. No.	Suggested Micro Projects
1.	Micro project: Study on performance comparison of AAC blocks, fly ash bricks, and conventional bricks.
2.	Preparation and testing of CSEB blocks using locally available soil materials
3.	Development of a low-cost concrete mix design using recycled aggregates or industrial waste.

c. Suggested Seminar Topics, Self- Learning Topics, Industrial Visits/Field Demonstration/Any other relevant activity, as applicable:

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/Field Demonstration	Any other Relevant Activity
1.	Seminar / Presentation: Use of recycled materials in infrastructure development.	-Online courses on sustainable construction materials and green building technologies.	One-day field visit to local construction sites and material suppliers, enabling students to observe, identify, and understand the properties, availability, and practical handling of commonly used construction materials.	
2.		-Video demonstrations on material testing procedures.		
3.		-IS/NBC standards related to construction materials.		

Sample Course Curriculum Detailing Format

L) SuggestedInstructional/ImplementationStrategies: Differentinstructional/ learning/ implementation strategies may be used appropriately, as per the requirement of the level of learners and outcome to be achieved. Some of them are improved lecture, tutorial, case method, group discussion, industrial visits, industrial training, field trips, role play, live demonstrations in classrooms, lab, field,project work, self-learning,etc. Use ofInformation and Communications Technology (ICT)based teaching learning, blended or flipped mode, brainstorming, expert session, video clippings, Online Educational Resources (OER), MOOCs, etc. are the some of the suggestive methods/ strategies to be adopted appropriately.

The relevant instructional/ implementation strategies may be mentioned appropriately as per the requirement of CO.

CO Statement	Suggested Relevant Instructional/ Implementation Strategies	Suggested Required Resources
CO1: Apply the methods of dressing and finishing of stones for construction purposes.	- Lecture method with case studies -Problem-based learning - Laboratory testing of materials and quality control (stones, bricks, cement, timber) - Field visit to material production industries	Human Resource ICT/ Multimedia
CO2: Analyse the manufacture, classification, properties, testing, and applications of bricks, blocks, and tiles used in construction engineering.	- Lecture method with case studies -Project-based learning related to CSEB, recycled materials, geopolymer concrete. - Seminar presentations on sustainable materials - ICT-based learning - Field visit to material production industries	Human Resource ICT/ Multimedia
CO3: Evaluate the properties, testing, preservation, seasoning, and applications of timber and timber products used in construction engineering.	-Interactive lectures with real-life engineering examples. -Problembased learning on corrosion and material failure - Field visit to material production industries. - ICT-based learning	Laboratory Set Up Human Resource ICT/ Multimedia
CO4: Assess the types, manufacture, properties, testing, grades, and applications of cement, admixtures, and mortar used in construction engineering.	-Interactive lectures -ICT-based learning -Laboratorytesting of steel and metals.	Laboratory Set Up Human Resource ICT/ Multimedia

Sample Course Curriculum Detailing Format

CO Statement	Suggested Relevant Instructional/ Implementation Strategies	Suggested Required Resources
CO5: Evaluate the properties, composition, corrosion behaviour, and applications of metals and alloys, including reinforcing and structural steel.	-Interactive lectures -Laboratorytesting of steel and metals. -Case study analysis of structural failures - Field visit to material production industries.	
CO6: Identify sustainable and innovative construction materials and their applications in modern infrastructure development.	- Group discussion on green building concepts -Case Study	

M) Suggested Learning Resources:

a) Books

S. No.	Titles	Author(s)	Publisher and Edition withISBN
1.	Engineering materials.	Rangawala, S. C. (2015.).	Charotar Publishing House, India
2.	Fundamentals of engineering materials.	Thornton, P. A., & Colangelo, V. J. (1985).	Prentice Hall.
3.	Engineering materials. .	Kumar, S. (2021).	Standard Publication and Distributors
4.	Engineering material.	Rajput, R. K. (2004).	S. Chand & Company Ltd.
5.	Civil engineering material.	Singh, P. (2008).	Katson Books.
6.	Material science and processes.	Khurmi, R. S., &Sedha, R. S. (2008).	S. Chand & Company Ltd.

b) Online Educational Resources (OER):

1) …….
2) …….
3) …….

c) Suggested List of Equipment: (For Class Size- 30)

S. No.	Name of the Equipment	Suggested Specifications	Remarks

Sample Course Curriculum Detailing Format

S. No.	Name of the Equipment	Suggested Specifications	Remarks
1.	Vicat Apparatus (cement consistency and setting time)	Relevant Indian Standard Codes	
2.			
3.			
4.			

N) (a) Course Curriculum Development Team (Respective Universities)

S. No.	Name and Designation	E-mail Address
1.		
2.		

(b) Course Curriculum Development Team (Academia & Experts)

S. No.	Name and Designation	E-mail Address
1.		
2.		

****

A)	**Course Title:** Indigenous Technology and Sustainable Construction
B)	**Course Code:** CVL 514
C)	**Major Pre- requisite Course (s):** N/A

D) Rationale: A significant number of people in Nepal reside in remote and/or rural areas with limited access to modern construction technology. The indigenous people in such areas use locally available and renewable materials in construction. This course enables the engineers to better design the construction projects using locally available resources with enhanced safety using sustainable development approaches.

E) Course Outcomes (COs): After the completion of the course, teachers are expected to ensure the attainment of following course outcomes by the learners.

Course Outcomes (COs)	Course Outcome Statements
CO1	Select locally available best suited construction materials for specific infrastructure purposes of the local indigenous people
CO2	Assess structural suitability of locally available construction materials and construction technology considering, strength, durability, cost, time, renewability and socio-cultural acceptability
CO3	Design masonry, bamboo, timber, and vernacular structural systems, in compliance with applicable seismic standards and climate resilient design principles in buildings and other structures

F) Course Articulation Matrix (CAM):

Course Outcomes (COs	Programme Outcomes (POs)											Programme Specific Outcomes (PSOs)*	
	PO1 Engineering Knowledge	PO2 Problem Analysis	PO3 Design/ Development of Solutions	PO4 Investigation	PO5 Modern Tool Usage	PO6 The Engineer and The Society	PO7 Ethics	PO8 Individual and Collaborative Team Work	PO9 Communication	PO10 Project Management and Finance	PO11 Life-long Learning	PSO1	PSO2
CO1	✓			✓		✓	✓	✓	✓		✓		
CO2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
CO3		✓	✓		✓		✓	✓	✓		✓		

Legend: High (3), Medium (2), Low (1) and No mapping (-)
Optional (*)

G) Teaching and Examination Scheme:

Civil and Architecture Subject Committee	Course Code	Course Category	Course Titles	Credits (C)	Teaching Scheme (Hours)				Examination Scheme (Marks)				Total Marks
									Theory		Practical		
					L	T	P	Total Hours (L+T+P)	ISA	ESA	ISA	ESA	
	CVL 514	PCC	Indigenous Technology and Sustainable Construction	2	2	1	2	5	30	50	10	10	100

Legend:
L: Lecture, T: Tutorial, P: Practical/ Laboratory, ISA: In Semester Assessment for theory and practical, ESA: End Semester Assessment for theory and practical
Sample Course Category: Applied Science Courses (ASC), Engineering Science Courses (ESC), Programme Core Courses (PCC), Programme Core Elective (PCE), Open Electives Courses (OEC), Humanities, Social Science and Management Courses (HSC), Project & Internship (PI), etc.

H) Course Curriculum Detailing: For attainment of course outcomes, the students are expected to perform/ undergo various activities through classroom, laboratories, workshops, tutorials, micro project, assignments, field sessions, self- learning assignment etc.
Unique features like green skills, SDGs, multidisciplinary aspects, love for our own country, motivation for startups, societal connect, renewable energy, etc. are integrated appropriately in the course curriculum document.

I) CO(s) Wise Suggested Contents:

Mapped CO(s) Number	Contents
CO1	**Unit- 1.0: Introduction to Indigenous and Sustainable Construction** 1.1 Concept of indigenous construction 1.2 Sustainable development in construction 1.3 Vernacular architecture in Nepal 1.4 Climate-responsive construction 1.5 ILO 169
CO1, CO2	**Unit 2: Indigenous Construction Materials** 2.1 Stone 2.2 Brick 2.3 Mud and adobe 2.4 Lime, surkhi, mud mortar 2.5 Timber 2.6 Bamboo 2.7 Thatch and natural fibres 2.8 Material testing and durability

Mapped CO(s) Number	Contents
CO2, CO3	**Unit- 3.0: Stone and Brick Masonry Construction** 3.1 Types of masonry structures in Nepal 3.2 Structural behavior of masonry walls 3.3 Seismic behavior of masonry buildings 3.4 Earthquake-resistant construction techniques 3.5 Design of load-bearing masonry walls 3.6 Retrofitting and strengthening methods
CO2, CO3	**Unit- 4.0: Timber Construction and Wooden Structures** 4.1 Traditional timber construction in Nepal 4.2 Engineering properties of wood. 4.3 Timber joints and connections 4.4 Design of timber beams and columns 4.5 Design of timber roof trusses
CO2, CO3	**Unit- 5.0: Bamboo Construction and Design** 5.1 Bamboo as a sustainable material 5.2 Mechanical properties of bamboo 5.3 Bamboo treatment and preservation 5.4 Bamboo joints and connections 5.5 Design of bamboo beams and columns 5.6 Bamboo truss systems
CO2, CO3	**Unit 6: Thatch, Earthen, and Vernacular Housing Systems** 6.1 Thatch roofing systems 6.2 Earthen houses and adobe construction 6.3 Wattle and daub construction 6.4 Thermal performance of earthen structures 6.5 Improvement techniques for resilience
CO1, CO2	**Unit 7: Sustainable Building Technologies** 7.1 Green building concepts 7.2 Energy-efficient buildings 7.3 Passive solar design 7.4 Rainwater harvesting 7.5 Renewable energy integration 7.6 Life cycle assessment
CO2, CO3	**Unit 8: Disaster-Resilient Indigenous Construction** 8.1 Earthquake-resistant indigenous housing 8.2 Traditional seismic-resilient features 8.3 Retrofitting techniques 8.4 Community-based resilient construction

J) CO(s) Wise Suggested List of Practicals:

Mapped CO(s) Number	Laboratory Experiment/ Practicals
CO1	1. Masonry wall construction demonstration

Mapped CO(s) Number	Laboratory Experiment/ Practicals
CO2, CO3	2. Preparation of stabilized mud blocks 3. Testing of indigenous construction materials 4. Timber joint detailing 5. Bamboo connection demonstration
CO3	6. Sustainable building assessment exercise

Note: Rubrics need to be prepared for effective performance by each student and their valid and reliable assessment.

K) Suggested In Semester Activities: This may include complex engineering problems, micro projects, seminar, self-learning, industrial/ field visit, assignment etc. It reinforces the development of spectrum of abilities needed for attainment of course outcomes. Complex engineering problems and micro projects need to be provided to learners to develop the problem solving, analytical, critical thinking, creative, investigative, exploring abilities in the learners and to prepare them as future ready work force. MOOCs, spoken tutorials, online educational resources etc. may be used for Self-Learning.

a. Suggested Complex Engineering Problems:

S. No.	Suggested Complex Engineering Problems
1.	Comparative analysis of structural stability of mixed structures (brick, stone, timber, bamboo)
2.	Performance evaluation of different types of wooden lock system in joist-based ceiling for structural flexibility
3.	Structural analysis of a bamboo pedestrian bridge conceptual design

b. Suggested Micro Projects:

S. No.	Suggested Micro Projects
1.	Prototype model building of a bamboo-based arch bridge
2.	Structural stability of masonry structure
3.	Design of an eco-friendly community centre

c. Suggested Seminar Topics, Self- Learning Topics, Industrial Visits/Field Demonstration/Any other relevant activity, as applicable:

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/ Field Demonstration	Any other Relevant Activity
1.	Sustainable Infrastructure Development in Nepal	Learn the basics of vernacular buildings (YouTube videos)	Field visit to a typical Newari settlement in Bhaktapur	

S. No.	Seminar Topics	Self- Learning Topics	Industrial Visits/ Field Demonstration	Any other Relevant Activity
2.	Earthquake-Resistant Construction Techniques for Rural Housing	Learn the basics of vernacular buildings (YouTube videos)	Wooden structures in hilly areas of Nepal	
3.	Bamboo as a Modern Structural Material			

L) Suggested Instructional/ Implementation Strategies: Different instructional/ learning/ implementation strategies may be used appropriately, as per the requirement of the level of learners and outcome to be achieved. Some of them are improved lecture, tutorial, case method, group discussion, industrial visits, industrial training, field trips, role play, live demonstrations in classrooms, lab, field, project work, self-learning, etc. Use of Information and Communications Technology (ICT) based teaching learning, blended or flipped mode, brainstorming, expert session, video clippings, Online Educational Resources (OER), MOOCs, etc. are the some of the suggestive methods/ strategies to be adopted appropriately.
The relevant instructional/ implementation strategies may be mentioned appropriately as per the requirement of CO.

CO Statement	Suggested Relevant Instructional/ Implementation Strategies	Suggested Required Resources
Assess structural suitability of locally available construction materials and construction technology considering, strength, durability, cost, time, renewability and socio-cultural acceptability	Show documentary related to suitability of locally available construction materials at different locations in Nepal	

M) Suggested Learning Resources:

a) Books

S. No.	Titles	Author(s)	Publisher and Edition with ISBN
1.	Building with Earth	Minke, G.	
2.	Masonry and Timber Structures Including Earthquake Resistant Design	Arya, A. S.	
3.	Designing and Building with Bamboo	Janssen, J.	
4.	Nepal National Building Code	DUDBC	DUDBC, Government of Nepal

b) Online Educational Resources (OER):

1) Building Construction and Materials – Open Educational Resource Textbook
2) Nepal National Building Code Resources
3) MIT OpenCourseWare – Ecologies of Construction

c) Suggested List of Equipment: (For Class Size- 30)

S. No.	Name of the Equipment	Suggested Specifications	Remarks
1.	Universal Testing Machine		Tensile test
2.	Compression Testing Machine		Compression test
3.	Rebound Hammer		
4.	Lignocellulose-based Analytical Device (LAD)		Remnant glucose level test

N) (a) Course Curriculum Development Team (Respective Universities)

S. No.	Name and Designation	E-mail Address
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(b) Course Curriculum Development Team (Academia & Experts)

S. No.	Name and Designation	E-mail Address
1.	Prof. Dr. R. K. Dixit	
2.	Prof. Dr. Chanchal Mehra	

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(A Deemed to be university under distinct category)

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