

**ACADEMIC AFFAIRS OFFICE  
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

No. Acd. 1744/IAPC-107

Dated: July 15, 2021

**Coordinator, Dam Safety and Rehabilitation**

The IAPC in its 107<sup>th</sup> meeting held on 07.07.2021 vide Item No. 107.2.2 considered the proposal of Programme Implementation Committee to interchange a PCC: DS 501 entitled 'Assessing and Managing Risks Associated with Dams' of I yr Autumn Sem with a PEC of I yr Spring Sem in the structure of M.Tech. (Dam Safety and Rehabilitation) programme

Further, the IAPC approved the proposal with minor modifications:

1. The subject area of DS-501 to be converted as PEC.
2. The I yr structure of M.tech. (Dam Safety and Rehabilitation) programme for Autumn Semester is revised in line with above amendment i.e.,
  - a) DS-501 (Assessing and Managing Risks Associated with Dams) to be removed.
  - b) Programme Elective Course-III to be added.

The amended structure and syllabus of DS-501 are attached as revised **Appendix-A.**



**Assistant Registrar (Curriculum)**

**Copy to (through e mail):-**

1. All faculty
2. Head of all Departments/ Centres
3. Dean, Academic Affairs
4. Associate Dean of Academic Affairs (Curriculum)
5. Channel i/ acad portal/ Academic webpage of iitr.ac.in

**INTERNATIONAL CENTRE FOR DAMS  
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

**Program Code:** XX M. Tech. (Dam Safety and Rehabilitation)  
**Year:** I

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
<b>Semester- I (Autumn)</b>														
1.	DS-502	Basics of Disaster Management and its Implementation Concepts	PCC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
2.	DS-503	Hydrologic Safety Evaluation of dams	PCC	4	3	1	-	3	-	20-35	-	20-30	40-50	-
3.		Programme Elective Course -I	PEC	4										
4.		Programme Elective Course -II	PEC	4										
5.		Programme Elective Course -III	PEC	4										
		Total		20	6	2								
<b>Semester-II (Spring)</b>														
1.	DS-504	Sediment Management in Reservoirs	PCC	4	3	1	-	3	-	20-35	-	20-30	40-50	0
2.	DS-505	Dam Safety Surveillance, Instrumentation and Monitoring	PCC	4	2	1	2/2	3	-	15-30	20	15-25	30-40	0
3.	DS-701	Seminar	SEM	2	-	-	-	-	-	-	-	-	100	-
4.		Programme Elective Course -I	PEC	4										
5.		Programme Elective Course -II	PEC	4										
6.		Programme Elective Course -III	PEC	4										
		Total		22	5	2	1							

\*Credit requirement for PG Diploma/ I<sup>st</sup> year M. Tech is 42 credits.

**INTERNATIONAL CENTRE FOR DAMS  
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

**Program Code:** XX M. Tech. (Dam Safety and Rehabilitation)  
**Year:** II

Teaching Scheme					Contact Hours/Week			Exam Duration		Relative Weight (%)				
S. No.	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWS	PRS	MTE	ETE	PRE
<b>Semester- I (Autumn)</b>														
1.	DS-701A	Dissertation Stage–I (to be continued next semester)	DIS	12	-	-	-	-	-	-	-	-	100	-
		Total		12										
Note: Students can take 1 or 2 audit courses as advised by the supervisor if required.														
<b>Semester-II (Spring)</b>														
1.	DS-701B	Dissertation Stage–II (contd. From III semester)	DIS	18	-	-	-	-	-	-	-	-	100	-
		Total		18										

<b>Summary</b>				
Semester	1	2	3	4
<b>Semester-wise Total Credits</b>	<b>20</b>	<b>22</b>	<b>12</b>	<b>18</b>
<b>Total Credits</b>	<b>72</b>			

## INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

**NAME OF DEPARTMENT/CENTRE:** International Centre for DAMS

1. **Subject Code:** DS-501      **Course Title:** Assessing and Managing Risks Associated with Dams
2. **Contact Hours:**            **L:** 3                            **T:** 1                            **P:** 0
3. **Examination Duration (Hrs.):**      **Theory:** 3                            **Practical:** 0
4. **Relative Weightage:**    **CWS:** 20-35      **PRS:** 0      **MTE:** 20-30      **ETE:** 40-50      **PRE:** 0
5. **Credits:** 4                            **6. Semester:** Both                            **7. Subject Area:** PEC
8. **Pre-requisite:** Nil
9. **Objective:** To provide necessary background about the various risk associated with dams and the techniques for dam safety assessment and management.

### 10. Details of the Course

S.No.	Contents	Contact hours
1.	<b>Overview of Dams Risk Assessment and Management:</b> Smart Governance and risk management, Risk analysis Formal Framework, Risk-informed decision-making and its importance in an integral Dam Safety Management Program, Dam Safety Program Fundamentals in USA, Spain, Argentina, Brazil etc.	4
2.	<b>Basis for a Risk-Informed Dam Safety Management Program for India:</b> Dam failure risks worldwide, Dam failure risks in India, Lessons learnt from Risk Assessment and Management worldwide.	6
3.	<b>Initial Risk-Based Screening:</b> Purpose of a risk-based screening tool, elements of the risk-based screening tool, brief reference to the Hazard Classification in India, dam safety inspections reports and DHARMA. Practical workshop or hands-on exercise.	5
4.	<b>Identification of Failure Modes:</b> PFMA (Potential Failure Mode Analysis), types of failure modes and loading scenarios, the purpose of the failure mode identification, Identification and classification of Failure Modes, Identification of investigation and surveillance needs, Proposal of risk reduction actions. Practical workshop or hands-on exercise.	5
5.	<b>Semi-Quantitative Risk Analysis:</b> Introduction, scope, and limitations of a semi-quantitative risk analysis (Failure probability categories Vs. Consequences categories), Prioritization of new studies or instrumentation. Practical workshop or hands-on exercise.	4
6.	<b>Quantitative Risk Assessment:</b> Introduction, scope and limitations. Incremental Risk Concept, Failure modes structure, Risk model input data, Levels of Detail in Risk Calculation input data, Event tree concept and calculation examples, Common Cause Adjustment, Risk Calculation in dam systems, Risk Representation (FN and FD Graphs). Uncertainty analysis in risk calculations. Practical workshop or hands-on exercise.	6
7.	<b>Risk Evaluation (Quantitative Risk Assessment):</b> Introduction, scope and limitations on Risk Evaluation process. Tolerability Guidelines Worldwide (ANCOLD, USBR, USACE, other countries/agencies), Proposal and justification of Tolerability Guidelines for India, Definition and prioritization	5

	of risk reduction actions, Risk reduction principles, Relation between quantitative risk models and DRIP Guidelines. Practical workshop or hands-on exercise.	
8.	<b>Portfolio Risk Management:</b> Introduction, Risk-informed decision-making inputs, risk-informed decision-making process (conditioning aspects). Structure of Reports on Dam Safety Risk Assessment. Practical workshop or hands-on exercise.	3
9.	<b>Risk Governance:</b> Introduction, Capacity building, Risk Communication, Overall Regulatory Framework, Review and quality assurance, Other Factors Affecting Decision Making- Climate Change, Inter-State Issues etc. <b>Institutional Framework in Dam Safety:</b> Perspective of Institutional framework in Switzerland, USA, Australia; Existing Dam Safety Monitoring Mechanism in India-Dam Safety Organization (DSO), National Committee on Dam Safety (NCDS), National Committee on Seismic Design Parameters (NCSDP); Dam Safety Legislation in India-Historical Development, Important Provisions of the Dam Safety Bill 2019.	4
<b>Total</b>		<b>42</b>

### 11. Suggested Books:

S.No.	Contents	Contact hours
1.	Zhang L., Peng M., Chang D. and Xu Y., “Dam Failure Mechanisms and Risk Assessment”, John Wiley & Sons	1976
2.	Hartford D. N. and Baecher G. B., “Risk and Uncertainty in Dam Safety”, Thomas Telford, Ltd	2004
3.	Raftery J., Loosemore M. and Reilly C., “Risk Management in Projects”, United Kingdom: Taylor & Francis	2006
4.	Rodríguez Valladares M., “Overview of Credit Risk Portfolio Management”, (n.p.): FT Press Delivers	2011
5.	“Risk Analysis, Dam Safety, Dam Security and Critical Infrastructure Management”. Netherlands: CRC Press	2011
6.	Solozhentsev E., “Risk Management Technologies: With Logic and Probabilistic Models”, Netherlands: Springer Netherlands	2012
7.	“Hydrology of Disasters”, Netherlands: Springer Netherlands	2012
8.	Iverson D., “Strategic Risk Management: A Practical Guide to Portfolio Risk Management”, Germany: Wiley	2013
9.	Wagner R., “The Handbook of Project Portfolio Management”, United Kingdom: Taylor & Francis	2018
10.	“Guidelines Assessing and Managing Risks Associated with Dams”, DRIP, DoWR, MoJ, GoI, New Delhi	2019