

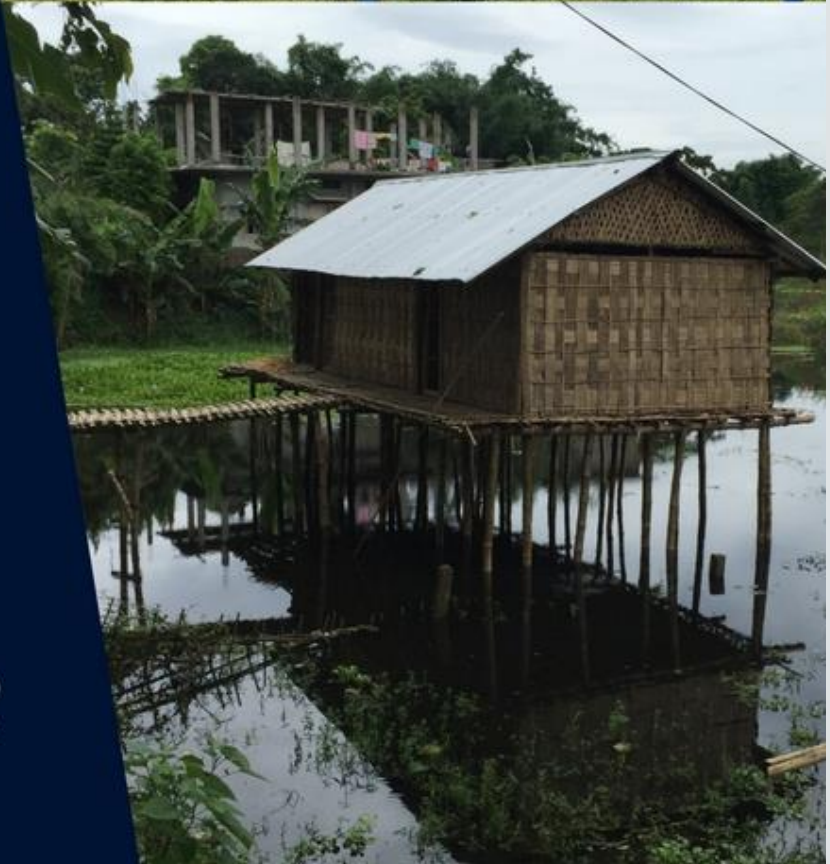
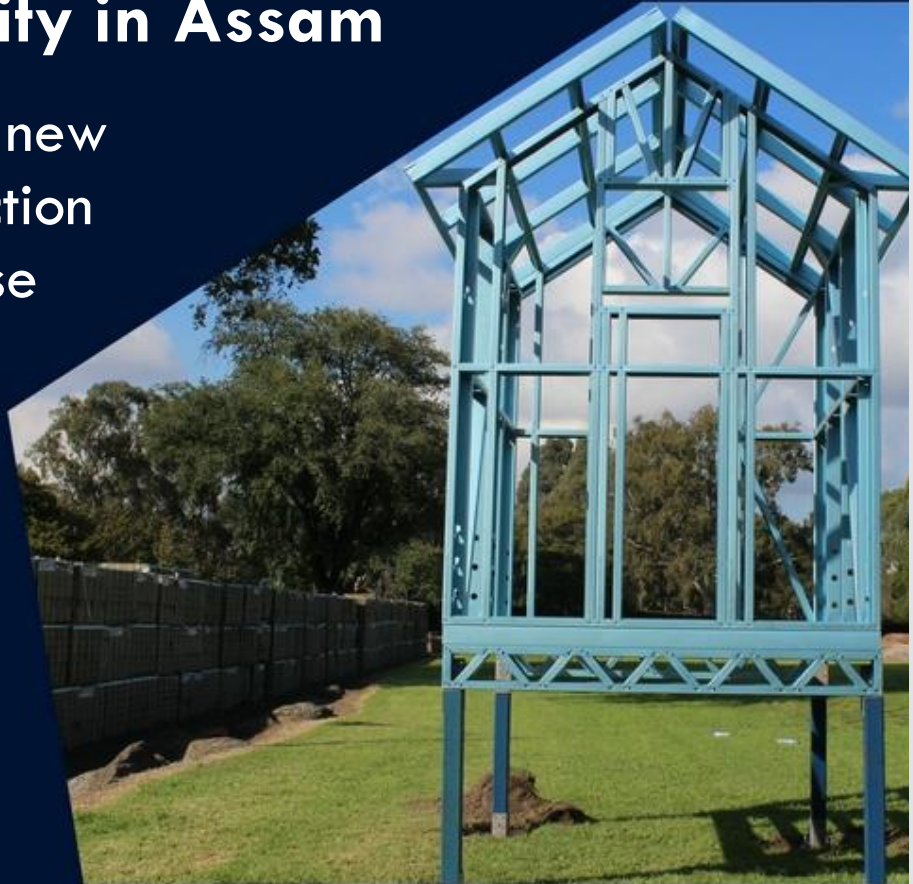


Sept 2017

Contextualization_Pap

Growing Capacity in Assam

Subject Design for new
Master of Construction
Management course



Assam Engineering College

Guwahati, Assam, India





Cross-cultural analysis and capacity building in construction management practices focusing on housing and infrastructure sectors in Assam and Australia.

Academic Visitors' Report

Curriculum Development Programme for new Construction Management course at Assam Engineering College

Visitors

Dr. Jayanata Pathak (21st Aug. – 25th Sept.)

Dr. Bipul Talukdar (14th Aug. – 06th Oct.)

Melbourne University

2017

Subject Schedule

Proposed course in Construction Management Assam Engineering College, Jalukbari

Introduction

As part of the recent research project in collaboration with the University of Melbourne, one of the key deliverables is the development of a new Construction Management course in Assam Engineering College. The course is required for providing relevant technical education to meet the growing demand in the construction industry across multiple sectors. The course will be of multidisciplinary nature. Students from any discipline upon completing the undergraduate degree can potentially develop the required technical knowledge in the construction management focusing on any areas of specialisation. Some of the areas of specialisation will be *Sustainability Management, Cost Management, Project Management, Building Construction & Technology* etc.

Construction Management Course (AEC)			
Specilisation 1	Specilisation 2	Specilisation 3	Specilisation 4
Sustainability Management	Cost Management	Project Management	Building Construction & Technology
Common Core Subjects			
Introduction to sustainability	Building Services and operations (SB)	Fundamentals of project management (PB)	Construction Materials (BT)
Specialisation Core Subjects			
Sustainable Solutions for Building (SB)	Building Regulations (JP)	Contract Management (JP)	Construction Law
Sustainable Materials and Performance	Construction Law	Project procurements	Building Construction (BT)
Construction Waste Management (PB)	Construction Methods and Equipment (SB+PB)	Project Monitoring and Control	Construction Methods and Equipment
Open Elective	Open Elective	Open Elective	Open Elective
Elective Subjects			
Laws and regulations for sustainability	Cost planning and budgeting	Project Finance and Economics	Building regulations
Environmenal Risks and Impacts Assessments	Measurement and Estimation	Construction Planning	Construction Methods and Equipment
Social Sustainability Analysis	Cost monitoring and control	Project Risks management	3R in Construction (BT+ JP)
Building regulations	Project procurements	TBA	TBA
Research Project	Research Project	Research Project	Research Project



MASTER OF CONSTRUCTION MANAGEMENT
ASSAM ENGINEERING COLLEGE
GUWAHATI-781013

CONSTRUCTION MATERIALS

(SUBJECT GUIDE)

(Version-1.0)
Developed by – Dr. Bipul Talukdar



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1.0 INTRODUCTION

Different materials are used in construction industries worldwide. The characteristics and behaviour of materials to be used in any construction project should be well understood. This document covers a brief study on some of the frequently used engineering materials. This subject guide helps the intended student and other readers to understand the basic objectives of this subject and how the students will be assessed during and after the completion of the course.

2.0 OVERVIEW & OBJECTIVES OF THE SUBJECT

This subject will focus on the development of the related knowledge on engineering materials commonly used in construction industry. The students and readers of the course will get first-hand knowledge on characteristics and behaviour of different construction materials. The objective of the study is to impart knowledge on some of the engineering materials.

3.0 LEARNING OUTCOMES

This subject will develop the following program learning outcomes.

On successful completion, students should be able to:

- Understand evolution and functional requirements of engineering materials.
- Develop and understand the physical and other properties of different materials.
- Understand different engineering materials commonly used in construction industry.
- Develop knowledge on innovative and energy efficient materials.
- Get basic knowledge on doing research for sustainable materials.

4.0 GENERIC SKILLS

On completion of the subject students should have developed the following skills and capabilities:



- Ability to identify various types of engineering materials available.
- Ability to understand properties and behaviour of different engineering materials.
- Ability to select appropriate type of material.
- Ability to understand importance of sustainable materials
- Ability to understand requirements of R&D works for development of new materials.

5.0 DETAILED SUBJECT SCHEDULE

Total contact period: 45 hours

Duration of Lecture: 1 Hour

Duration of Tutorial: 1 hours

Table 1: Detailed subject schedule

Week No.	Lecture	Topic	Learning Activities
1	Lecture 1:	Introduction to Engineering Material • Introduction • Evolutionary Trends in Construction Materials	Reading list: CM-L1-2.1 (Essential) CM-L1-2.2 (Optional)
	Lecture 2:	• Traditional and Innovative Materials • Properties of Materials. • Functional Requirements of Materials.	
	Tutorial 1:	Worked Examples and Reflections (Lecture 1 & 2)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 1 & 2.
2	Lecture 3:	Cement • Types of Cement • Compounds of Cement	Reading list: CM-L3-4-5.1 CM-L3-4-5.2 CM-L3-4-5.3 CM-L3-4-5.4 CM-L3-4-5.5 CM-L3-4-5.6
	Lecture 4:	• Hydration of Cement • Structure of Cement Paste	



Week No.	Lecture	Topic	Learning Activities
	Tutorial 2:	Worked Examples and Reflections (Lecture 3 & 4)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 3 & 4.
3	Lecture 5:	- Physical Properties of Cement - Lime and Other Cementitious Materials.	
	Lecture 6:	Physical Properties of CA and FA.	CM-L6.1 to CM-L6.9 (Essential) CM-L6.10(Optional)
	Tutorial 3:	Worked Examples and Reflections (Lecture 5 & 6)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 5 & 6.
4	Lecture 7:	Fresh Concrete - Introduction - Batching, Mixing - Workability of Concrete	Reading list: CM-L7-8.1 CM-L7-8.2 (Essential) CM-L7-8.3 CM-L7-8.4 (Optional)
	Lecture 8:	- Role of Admixture in Workability - Segregation and Bleeding	
	Tutorial 4:	Worked Examples and Reflections (Lecture 7 & 8)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 7 & 8.
5	Lecture 9:	Hardened Concrete - Mechanical Properties of Hardened Concrete - Water-cement ratio	Reading list: CM-L9-10.1 CM-L9-10.2 CM-L9-10.3 CM-L9-10.4 (Essential) CM-L9-10.5 (Optional)
	Lecture 10:	- Porosity - Curing of concrete	
	Tutorial 5:	Worked Examples and Reflections (Lecture 9 & 10)	Discussions/quiz etc. based on the



Week No.	Lecture	Topic	Learning Activities
			contents of Essential Readings of Lecture 9 & 10.
6	Lecture 11:	• Special Concretes • Different Types and their usefulness	Reading list: CM-L11.1 CM-L11.2 (Optional)
	Lecture 12:	Durability of Concrete • Strength vs. Durability • Role of Mineral Admixtures • W/C ratio and • Cement Content	Reading list: CM-L12-13.1 (Essential) CM-L12-13.2 (Optional)
	Tutorial 6:	Worked Examples and Reflections (Lecture 11 & 12)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 11 & 12.
7	Lecture 13:	• Chloride and Sulphate Attack on Concrete • Alkali-Aggregate Reaction • Acid Aggregate Reactions.	Reading list: CM-L12-13.1 (Essential) CM-L12-13.2 (Optional)
	Lecture 14:	Construction Chemicals • Water Reducing Agents • Consistency Improver	Reading list: CM-L14-15.1 CM-L14-15.2 (Essential) CM-L14-15.3 CM-L14-15.4 (Optional)
	Tutorial 7:	Worked Examples and Reflections (Lecture 13 & 14)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 13 & 14.
8	Lecture 15:	• Accelerators and Retarders • Corrosion Inhibitors • Permeability Reducer	Reading list: CM-L14-15.1 CM-L14-15.2 (Essential) CM-L14-15.3 CM-L14-15.4 (Optional)



Week No.	Lecture	Topic	Learning Activities
	Lecture 16:	Bricks Raw Materials - Drying and Burning - Strength and Durability	Reading list: CM-L16.1 CM-L16.2 CM-L16.3 (Essential)
	Tutorial 8:	Worked Examples and Reflections (Lecture 15 & 16)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
	Assignment 1:	Analysis of Building Materials used in a Building (Draft Report to be Submitted)	
9	Lecture 17:	- Mortar for Masonry - Strength of Masonry	Reading list: CM-L17.1 (Optional)
	Lecture 18:	Flooring Materials Ceramics Tiles Vitrified Tiles Granite and Marble	Reading list: CM-L18.1 (Essential)
	Tutorial 9:	Worked Examples and Reflections (Lecture 17 & 18)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 17 & 18.
10	Lecture 19:	Metals - Steel for Reinforced Concrete and Prestressed Concrete Construction - Structural Steel Sections	Reading list: CM-L19.1 CM-L19.2 (Essential)
	Lecture 20:	Timber and Bamboo - Seasoning and Conversions - Properties - Physical Tests - Defects in Timbers	Reading list: CM-L20-21.1 CM-L20-21.2 CM-L20-21.3 CM-L20-21.4 (Essential)
	Tutorial 10:	Worked Examples and Reflections (Lecture 19 & 20)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 19 & 20.
11	Lecture 21:	Timber Based Products Introduction	Reading list: CM-L20-21.1



Week No.	Lecture	Topic	Learning Activities
		- Ply Board - Particle Board - Veneer	CM-L20-21.2 CM-L20-21.3 CM-L20-21.4 (Essential)
	Lecture 22:	Glass - Chemical Compositions - Manufacturing Processes	Text Books
	Tutorial 11:	Worked Examples and Reflections (Lecture 21 & 22)	Discussions/quiz etc. based on the contents of CM- L24.1 Essential Readings of Lecture 21 & 22.
12	Lecture 23:	- Mechanical and Optical Properties - Various Types of Glasses - Strengthening of Glasses	Text Books
	Lecture 24:	Plastics and Polymers in Construction - Introduction - Admixture Paints - Sealants and Adhesives	Reading list: CM-L24.1 CM-L24.2 CM-L24.3 CM-L24.4
	Tutorial 12:	Worked Examples and Reflections (Lecture 23 & 24)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 23 & 24.
	Assignment 2:	Analysis of Building Materials used in a Building (Draft Report to be Submitted after peer review.)	
13	Lecture 25:	Materials used for - Damp Proofing - Water Proofing	Reading list: Text Books (Essential) CM-L25.1 (Optional)
	Lecture 26	Thermal Insulation	Text Books NBC (2005)
	Tutorial 13:	Worked Examples and Reflections (Lecture 25 & 26)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 25 & 26.
14	Lecture 27	Sound Insulation	Text Books



Week No.	Lecture	Topic	Learning Activities
	Lecture 28:	Innovative Materials • Introduction • Solid and Hollow Concrete Blocks • Autoclave Aerated Concrete	Reading list: CM-L28-29-30.1 CM-L28-29-30.2 CM-L28-29-30.3 CM-L28-29-30.4
	Tutorial 14:	Worked Examples and Reflections (Lecture 27 & 28)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 27 & 28.
	Assignment 3:	Analysis of Building Materials used in a Building (Final Report to be submitted)	
15	Lecture 29:	• Fly-ash bricks • Inter-locking Paver Block	Reading list: CM-L28-29-30.5 CM-L28-29-30.6 CM-L28-29-30.7 CM-L28-29-30.8
	Lecture 30:	• Aluminium Composite Panels • Galvalume Sheets	
	Tutorial 15:	Worked Examples and Reflections (Lecture 29 & 30)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 29 & 30.
16	Group Discussions	Date and Topics TBA later	
	Final Presentations	Date and Topics TBA later	

6.0 PEDAGOGICAL APPROACH, ACTIVITIES

The pedagogical approach is based on classroom lectures of up to 1 hour duration twice a week during the course. The lectures will involve a range of teaching topics, which will include theoretical background on basic engineering materials. The teaching modes apart from classroom lectures will include group various activities such as, group tasks, site visits, preparation of case studies, evaluation of existing engineering materials in terms of their performance, and guest presentations from industry professionals on specific topics to provide both specialist knowledge and state of the practice to give an insight to real world



issues. Seminars will be held every week so that each student can share their knowledge, ask questions and dive further in to the subject materials.

The timings of the scheduled activities will be provided at the beginning of the course, depending on the annual academic calendar of the college.

7.0 ASSESSMENT

Assessment in this subject has both formative and summative aspects to it. The students will have an opportunity to provide formative feedback to their peers and receive constructive feedback in return, as well as from the subject coordinator. This will give them the opportunity to develop and improved on particular skills throughout the course of the subject.

There are five assessment tasks in this subject. The assessment tasks (class participation, assignment 1 to 3 and final presentation) mimic the activities that a student is most likely to undertake in a real situation. This task will be used to demonstrate that the student have developed the skills needed to understand the behaviour of appropriate type of material.

The students' main tasks will be to identify appropriate type of material, study different characteristics and present their findings in a professional report and an oral presentation. A summary of the marking scheme is provided in Table 2. Specific requirements for each task are provided in section 7.1 and 7.2.

7.1 Class participation

The subject involves a range of activities and participation of the student is critical for achieving the learning outcome of the subject. The assessment for this task will involve a number of in-class discussion and quizzes relating to content covered during tutorials. The students will be assessed on their ability to

- Understand and interpret themes discussed during seminars
- Respond appropriately to questions.

7.2 Assignment

7.2.1 Analysis of Building Materials used in a Building

As a part of a R&D team visiting a residential/commercial building under Guwahati Municipal Corporation (GMC) jurisdiction area, the student will be asked to undertake an analysis of different types on materials that has been used in the building in its present condition. This will include

- Identification of different types of materials used in various components in the building.
- Listing of physical and chemical properties of those materials.
- Examining the appropriateness of each of the materials in conjunction with typology, weather, location, vulnerability towards natural disaster etc.
- If not found appropriate, suggest alternative materials.
- Critical review of the used materials on energy efficiency, carbon footprint and sustainability issues should be included.



The analysis of the current study as well as the recommendations with explanations will have to be submitted to the Co-ordinator of the course with a copy to Chairman, GMC in the form of a report.

The exact structure of the report is up to the student, but the student should attempt to address the above mentioned areas in his/her report.

Report format

The report should be presented in A4 format with margins of 2.50m in each side and the pages numbered. The line spacing should be 1.50 cm. Both sides of the page should be utilized for printing.

Heading, tables, diagrams are to be used and appropriately numbered. An abstract or executive summary at the beginning of the report is to be included (which will include key findings and recommendations). There is no page limit as such for the report, but it should be approximately 5000 words in length (excluding tables, diagrams and references)

Use of references to existing research/literature in order to support the argument of the report is to be included and properly referenced. The Harvard referencing format (i.e. Author (year)) should be used to cite specific references and all the references should be referred to in a 'References' section at the end of the report.

As the student will be presenting the report and its major findings to the GMC (subject coordinator and invited panel members) during the last week of the semester, the report should be written in a style and format that reflects its intended purpose, considering that the report is being drafted by a member of GMC.

The students are advised to refer to online skill development courses provided by www.coursera.org to get a better idea of how to put their ideas to words. The following links may be useful for the students
<https://www.coursera.org/learn/business-writing>
<https://www.coursera.org/specializations/academic-english>

Submission – Draft Report

The students are required to submit a draft of their report in week 8. The draft report should, as a minimum be structured and formatted as it is planned to present the final report. It should include all the items as mentioned in clause 7.2.1

The Draft Report should not provide any identifying details (name, enrolment number etc) that could be used to identify the student, as the peer review process will be anonymous. Submit your draft report in print form with proper spiral bind.

7.2.2 Peer Review

Students are required to critically review one of their colleagues' draft reports and provide constructive feedback on how they might be improved. The review should



be approximately between 500-1000 words. Primary focus should be on the strengths and weakness of the peer's draft report and how well they address the requirement of the task across the following criteria.

- Abstract / Executive summary
- Table of contents provided
- Ability to map the existing types of building materials and their properties.
- Use of diagrams/description to effectively illustrate the problem at hand.
- Indication of potential areas for improvement by using alternative materials in the line of typology, weather, location, vulnerability towards natural disaster etc.
- Indication of potential areas for improvement in the form of energy efficiency, carbon footprint and sustainability issues.
- Suggested solutions.
- Presented in a concise, professional and well-structured manner.
- Integration of references to relevant literature.

The peer review should focus on making suggestions to help the peer further develop and improve their report.

Peer review assessment criteria

The student will be assessed in his ability to:

- Demonstrate a complete understanding on the subject matter.
- Apply that understanding to the analysis and critique of the peer's draft report.
- Critically evaluate the work of peer's and provide constructive feedback.
- To use skill and sensitivity in providing formative (constructive) feedback to peers.

The peer feedback of a draft report of a student will be provided to the student after the completion of the process i.e. by Week 12.

7.2.3 Submission – Final Report

The final report should be submitted in printed form after considering and incorporating the suggestions made in the peer review comments (if any). Reports submitted after the due date will incur a 10 % penalty of the available marks in that section, unless prior application for special consideration has been submitted and approved.

Final Report Assessment Criteria

The student will be assessed on their ability to

- Identify different types materials used in the building and mapping of their behaviour (properties).
- Use of diagrams/description to effectively illustrate the problem at hand.
- Indicate potential areas for improvement by using alternative materials in the line of typology, weather, location, vulnerability towards natural disaster etc.
- Indicate potential areas for improvement in the form of energy efficiency, carbon footprint and sustainability issues.
- Suggested solutions.
- Presented in a concise, professional and well-structured manner.
- Integration of references to relevant literature.



7.2.4 Final Presentation

The student will present the major findings from his/her final report to the panel members (co-ordinator and invited reviewers). The ideas that have been identified have to be presented.

Format

The presentation should be addressed to the panel members, The student is welcome to present in an own format, but it has to be remembered that the format maximises the exposure to the content of the presentation.

Presentation : 15 minutes followed by Q&A : 5 minutes

Assessment Criteria

The presentation will be assessed by the panel members on the way of presentation and communication skills. The student will be assessed on his/her ability to:

- Describe the use of different engineering materials.
- Describe the suggested changes in using materials.
- Convince the panel members of the need to change the practices and explain the rationale behind it.
- Communicate the findings of the evaluation of the present building.

Presentation date: Week 16.

Students are required to be available for the entire week. The time of presentation will be advised at a later date.

7.3 Marking Scheme (It is to be revised as per Indian University/Affiliated university regulation)

Table 2 provides the detailed marking scheme in this subject.

Table 2: Summary of Assessment Tasks and Marking scheme

Assessment category	Brief Discussion	Weight (%)	Pass (%)	To pass, a student has to	
				obtain a minimum marks of	Out of
Class participation	Participation in weekly activities and active involvement in class discussion	10	4	8	20
Assignment 1 (Draft)	See Below	10	4	8	20
Assignment 2 (Peer Review)	Review of peer report (1000 words)	10	4	8	20



Assessment category	Brief Discussion	Weight (%)	Pass (%)	To pass, a student has to	
				obtain a minimum marks of	Out of
Assignment 3 (Final)	Professional report outlining as assessment of building materials and suggestions for improvement. (5000 words)	10	4	8	20
Final Presentation	Presentation of report findings and recommended improvements.	10	4	8	20
End semester exam	Theory based.	50	20	40	100
Total	--	100	40	80	200

The students will have to appear in an end semester examination (as per the guidelines of the University under which AEC is affiliated) which will be subjective in nature. A minimum mark of 40% (each assessment category) must be achieved in the examination in order to pass the subject. The assignments/ presentations can be re-submitted in a semester if a student fails to score the requisite pass marks. However, if a student fails to achieve 40 % marks in the theory exam he will be deemed to fail in the subject and will have to clear in the next attempt.

8.0 REQUIRED READING

Students are expected to refer to various building operations and services related topics from various sources, which might include case studies, conferences papers, library collections, eBooks and eJournals. A list of essential and optional reading is provided in Table – 3, Clause 13.



9.0 REQUIRED TEXTS

1. S. Somayaji, Civil Engineering Materials, Prentice Hall, New Jersey, 2001.
2. M. S. Mamlouk and J. P. Zanievski, Materials for Civil and Construction Engineers, Pearson, 2nd Edition, 2006.
3. N. Jackson and R.K. Dhir, Civil Engineering Materials, McMillan, 4th Edition, 1997.
4. K. S. Jagadish, B. V. V. Reddy & K. S. N. Rao, Alternative Building Materials and Technologies, New Age International, 2006.

REFERENCE BOOKS

1. A. M. Nevilli and J. J. Brooks, Concrete Technology, Pearson Education, 2004
2. M. S. Shetty, Concrete Technology, S. Chand & Co. Ltd. , 2005.
3. K. S. Jagdish, B. V. V. Reddy and K. S. N. Rao, Alternative Building Materials and Technologies, New Age International, 2006.
4. National Building Code of India, BIS, 2005
5. Handbook on Repair and Rehabilitation of RCC Buildings, CPWD, India.
6. Building Materials and Components, Central Building Research Institute, Roorkee, India, 1990

10.0 ATTENDANCE POLICY

The attendance policy is as per the standard university guidelines (under which AEC is affiliated).

11.0 PLAGIARISM, COLLUSION AND CONSEQUENCES

Merriam-Webster's online dictionary explains that **Plagiarism** is the act of stealing and passing off (the ideas or words of another) as one's own; or using another's production without crediting the source; or to commit literary theft i.e. to present as new and original an idea or product derived from an existing source.

Collusion is the presentation by a student of an assignment as his or her own which is in fact the result in whole or part of unauthorised collaboration with another person or persons.



In any case where a student has been involved in plagiarism or collusion in an assessable assignment on task the marks awarded for that will be zero, and no substitution of an alternative task will normally be permitted.

12.0 Reading List

The reading list (as provided in Table 3) provides the literature that a student is expected to go through to understand the topics of the syllabus. However, this list is not an extensive one and may be updated and altered as and when necessary. Students are encouraged to come up with suggested literature in this field for discussion in or off the class.

Table 3: Reading List

Reading	Reference	Suggested Literature
CM-L1-2.1	Lecture 1 & Lecture 2	S. Somayaji, Civil Engineering Materials, Prentice Hall, New Jersey, 2001. M. S. Mamlouk and J. P. Zaniewski, Materials for Civil and Construction Engineers, Pearson, 2 nd Edition, 2006. N. Jackson and R.K. Dhir, Civil Engineering Materials, McMillan, 4th Edition, 1997.
CM-L1-2.2		F. Pacheco-Torgal, and J. A. Labrincha (2013) The future of construction materials research and the seventh UN Millennium Development Goal: A few insights, Construction and Building Materials, Vol. 40, pp 729-737.
CM-L3-4-5.1	Lecture 3 Lecture 4 & Lecture 5	F. Sorrentino (2011) Chemistry and engineering of the production process: State of the art, Cement and Concrete Research, Vol. 41, pp 616-623.
CM-L3-4-5.2		K. L. Scrivener, P. Juilland, P. J.M. Monteiro (2015) Advances in understanding hydration of Portland cement, Cement and Concrete Research, Vol. 78, pp 38-56.
CM-L3-4-5.3		V. Zetola (2011) Differences in basic standards of common cements, Cement and Concrete Research, Vol. 41, pp 764-766.
CM-L3-4-5.4		R. D. Hooton (2015) Current developments and future needs in standards for cementitious materials, Cement and Concrete Research, Vol. 78, pp 165-177.
CM-L3-4-5.5		B. Lothenbach, K. Scrivener, and R.D. Hooton (2011) Supplementary cementitious materials, Cement and Concrete Research, Vol. 41, pp 1244-1256.



Reading	Reference	Suggested Literature
CM-L3-4-5.6		M. Schneider, M. Romer, M. Tschudin and H. Bolio (2011) Sustainable cement production—present and future, <i>Cement and Concrete Research</i> , Vol. 41, pp 642-650.
CM-L6.1 to CM-L6.8	Lecture 6	IS : 2386 (Part I to VIII) – 1963 <i>Indian Standard</i> Methods of Test for Aggregates for Concrete.
CM-L6.9		IS : 383 – 1970 <i>Indian Standard</i> Specification for Coarse and Fine Aggregates from Natural Sources for Concrete.
CM-L6.10		F. D Lydon and H. H. Al-Mahfoud (1989) Water Absorption by Aggregate : A simple Approach to Assessment of Pore Characteristics, <i>Construction and Building Materials</i> , Vol.3(1), pp. 1-7.
CM-L7-8.1	Lecture 7 and Lecture 8	K. Kovler and N. Roussel (2011) Properties of fresh and hardened concrete, <i>Cement and Concrete Research</i> , Vol. 41, pp 775-792.
CM-L7-8.2		IS : 456 – 2000 <i>Indian Standard</i> Plain and Reinforced Concrete - Code of Practice.
CM-L7-8.3		P. C. Aïtcin (2000) Cements of yesterday and today Concrete of tomorrow, <i>Cement and Concrete Research</i> , Vol. 30, pp 1349-1359.
CM-L7-8.4		J. Plank, E. Sakai, C.W. Miao, C. Yu and J.X. Hong (2015) Chemical admixtures — Chemistry, applications and their impact on concrete microstructure and durability, <i>Cement and Concrete Research</i> , Vol. 78, pp 81-99.
CM-L9-10.1	Lecture 9 and Lecture 10	IS : 456 – 2000 <i>Indian Standard</i> Plain and Reinforced Concrete - Code of Practice.
CM-L9-10.2		IS : 516 – 1959 <i>Indian Standard</i> Methods of Tests for Strength of Concrete
CM-L9-10.3		IS : 1199 – 1959 <i>Indian Standard</i> Methods of Sampling and Analysis of Concrete.
CM-L9-10.4		K. Kovler and N. Roussel (2011) Properties of fresh and hardened concrete, <i>Cement and Concrete Research</i> , Vol. 41, pp 775-792.
CM-L9-10.5		D. N. Richardson (1991) Review of Variables that Influence Measured Concrete Compressive Strength, <i>Journal of Materials in Civil Engineering</i> , ASCE, Vol. 3, No. 2, May, 1991 pp.95-112.
CM-L11.1	Lecture 11	D. W. Caijun Shi, Z. W. Jianfan Xiao, Z. Huang and Z, Fang (2015) A review on ultra high performance concrete: Part II. Hydration, microstructure and properties, <i>Cement and Concrete Research</i> , Vol. 96, pp 368-377.



Reading	Reference	Suggested Literature
CM-L11.2		F. P. Torgal, S. Miraldo, Y. Ding and J.A. Labrincha (2013) Targeting HPC with the help of nanoparticles: An overview, <i>Cement and Concrete Research</i> , Vol. 38, pp 365-370.
CM-L12-13.1	Lecture 12 and Lecture 13	IS : 456 – 2000 <i>Indian Standard</i> Plain and Reinforced Concrete - Code of Practice.
CM-L12-13.2		J. R. Triano and G. C. Frantz (1992) Durability of Msw Fly-Ash Concrete, <i>Journal of Materials in Civil Engineering</i> , ASCE, Vol. 4, No. 4, pp. 369-384.
CM-L14-15.1	Lecture 14 and Lecture 15	IS : 1727 – 1967 <i>Indian Standard</i> Methods of Test for Pozzolanic Materials.
CM-L14-15.2		IS : 9103 – 1999 <i>Indian Standard</i> Concrete Admixtures – Specifications.
CM-L14-15.3		J. Cheung, L. Roberts and J.Liu (2017) Admixtures and sustainability, http://dx.doi.org/10.1016/j.cemconres.2017.04.011
CM-L14-15.4		J. Plank, E. Sakai, C.W. Miao, C. Yu and J.X. Hong (2015) Chemical admixtures — Chemistry, applications and their impact on concrete microstructure and durability, <i>Cement and Concrete Research</i> , Vol. 78, pp 81-98.
CM-L16.1	Lecture 16	IS : 2117 – 1991 <i>Indian Standard</i> Guide for Manufacture of Hand-Made Common Burnt Clay Building Bricks.
CM-L16.2		IS : 1077 – 1992 <i>Indian Standard</i> Guide for Common Burnt Clay Building Bricks- Specification.
CM-L16.3		P. Muñoz V., M.P. Morales O., V. Letelier G. and M.A. Mendivil G. (2016) Fired clay bricks made by adding wastes: Assessment of the impact on physical, mechanical and thermal properties, <i>Cement and Concrete Research</i> , Vol. 125, pp 241-252.
CM-L17.1	Lecture 17	A. Moropoulou, G. Biscontin, A. Bakolas and K. Bisbikou (1997) Technology and behavior of rubble masonry Mortars, <i>Construction and Building Material</i> Vol. 11, No. 2, pp. 119-129.
CM-L18.1	Lecture 18	Victor C. Li and C. K. Y. Leung (1988) <i>Ceramics for Construction, Construction and Building Materials</i> , Vol. 2 No. 2 pp. 59-68.
CM-L19.1	Lecture 19	C. J. Billington (1987) <i>Developments in the use of Steel in Construction, Construction and Building Material</i> Vol. 1, No. 1, pp. 19-23.



Reading	Reference	Suggested Literature
CM-L19.2		IS 1786 : 2008 High Strength Deformed Bars and Wires for Concrete Reinforcement — Specification
CM-L20-21.1	Lecture 20 and Lecture 21	A F. Asdrubali, B. Ferracuti, L. Lombardi, C. Guattari, L. Evangelisti and G. Grazieschi (2017) Review of structural, thermo-physical, acoustical, and environmental properties of wooden materials for building applications, <i>Building and Environment</i> , Vol. 114, pp-307-332.
CM-L20-21.2		K. J. Fridley(2002) Wood and Wood-Based Materials: Current Status and Future of a Structural Material, <i>Journal of Materials in Civil Engineering</i> , ASCE, Vol. 14, No. 2, pp. 91-96.
CM-L20-21.3		C. R. Coggins (1989) Timber Preservation in Building and Construction, <i>Construction and Building Material</i> Vol. 3, No. 2, pp. 114-117.
CM-L20-21.4		Necessary Indian Standards.
CM-L22	Lecture 22	Text Books
CM-L23	Lecture 23	Text Books
CM-L24.1	Lecture 24	IS : 1477(Part –I) – 1971 Code of Practice for Painting of Ferrous Metals in Buildings.
CM-L24.2		IS : 1477(Part –II) – 1971 Code of Practice for Painting of Ferrous Metals in Buildings.
CM-L24.3		IS : 2395(Part –I) – 1994 Code of Practice For Painting Of Concrete, Masonry and Plaster Surfaces - Code of Practice
CM-L24.4		IS : 2395(Part –II) – 1994 Code of Practice For Painting Of Concrete, Masonry and Plaster Surfaces - Code of Practice
CM-L25	Lecture 25	E. Franzoni (2014) Rising damp removal from historical masonries: A still open challenge, <i>Construction and Building Materials</i> , Vol. 54 pp. 123-136.
CM-L26	Lecture 26	Text Books
CM-L27	Lecture 27	Text Books
CM-L28-29-30.1		IS : 2185(Part I)-1979 Specification for Concrete Masonry Units (Part I Hollow and Solid Concrete Blocks)



Reading	Reference	Suggested Literature
CM-L28-29-30.2	Lecture 28 Lecture 29 and Lecture 30	IS : 2185(Part II)-1979 Specification for Concrete Masonry Units (Part II Hollow and Solid Lightweight Concrete Blocks)
CM-L28-29-30.3		IS : 2185(Part III)-1979 Specification for Concrete Masonry Units (Part III Autoclaved Cellular Aerated Concrete Blocks)
CM-L28-29-30.4		IS : 2572 – 1963 Code of Practice for Construction of Hollow Concrete Block Masonry
CM-L28-29-30.5		IS 12894:2002 Pulverized Fuel Ash-Lime Bricks — Specification
CM-L28-29-30.6		IS 13757 : 1993 Burnt Clay Fly Ash Building Bricks — Specification.
CM-L28-29-30.7		IS 15658:2006 Precast Concrete Blocks for Paving — Specification
CM-L28-29-30.8		X. Qu And X. Zhao (2017) Previous and Present Investigations on the Components, Microstructure and Main Properties of Autoclaved Aerated Concrete – A Review, Construction and Building Materials, Vol. 135, Pp.505-516.

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For any query please contact the subject coordinator over phone or email.

**The study materials for the entire subject have been
developed and will be available electronically.**



MASTER OF CONSTRUCTION MANAGEMENT
ASSAM ENGINEERING COLLEGE
GUWAHATI-781013

BUILDING REGULATIONS
(SUBJECT GUIDE)

(Version-1.0)
Prepared by – Dr. Jayanta Pathak



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1.0 INTRODUCTION

Building Regulations, Codes or Bye-Laws are required in order to provide safe and healthy habitat with careful consideration of the building construction activity. Building planning, designing and construction activities have developed over the centuries and a large number of ancient monuments and historical buildings all over the world bear testimony to this. Technological and socio-economic developments in recent times have led to remarkable increase in demand for more and more sophistication in buildings resulting in ever increasing complexities. Building Regulations, Codes or Bye-Laws are legal tools used to regulate coverage, height, building space, architectural design and construction aspects of buildings so as to achieve orderly development of an area. They are mandatory in nature and serve to protect buildings against fire, earthquake, noise, structural failures and other hazards. Buildings must conform to the code to obtain planning permission, usually from the urban local bodies or other local governments. The main purpose of building codes is to protect public health, safety and general welfare as they relate to the construction and occupancy of buildings and structures. The building code becomes law of a particular jurisdiction when formally enacted by the appropriate governmental authority. Building codes are generally intended to be complied by architects, engineers, interior designers, constructors and regulators but are also used for various purposes by safety inspectors, environmental scientists, real estate developers, subcontractors, manufacturers of building products and materials, insurance companies, facility managers, tenants, and others. The practice of developing, approving, and enforcing building regulations or building code varies considerably among nations. In some countries building codes are developed by the government agencies or quasi-governmental standards organizations and then enforced across the country by the central government. Such codes are known as the National Building Codes as in case of India, National Building Code drafted by the Bureau of Indian Standard (BIS) is adopted by various state governments as the governing regulations by incorporating in to the building bye laws of the local governments. In India, each municipality and urban development authority has its own building code, which is mandatory for all construction within their jurisdiction. All these local building codes are variants of a National Building Code, which serves as model code proving guidelines for regulating building construction activity.

2.0 OVERVIEW & OBJECTIVES OF THE SUBJECT:

This subject provides an overview of the existing building regulations in the form various building codes and building bye-laws and by showing and reflecting on how the established set of building codes and regulations applies to building constructions to provide minimum standards for safety. The building regulations are also intended to provide health, and general welfare including structural integrity, mechanical integrity (including sanitation, water supply, light, and ventilation), means of egress, fire prevention and control, and energy conservation.



Through project simulations and structured discussion, students are made aware of the regulation issues pertaining to standards for functional requirement of the building structure, energy efficiency, installation and safety aspects of mechanical, electrical, plumbing systems, compliance to site drainage & storage requirements, occupancy rules, rules regarding parking and traffic impact, fire code rules to minimize the risk of a fire and to ensure safe evacuation in the event of such an emergency, requirements for earthquake safety, cyclone, flood, and tsunami resistance, especially in disaster prone areas or for very large buildings where a failure would be catastrophic.

The student will have clear understanding of -

- Jurisdiction and Applicability of **Building Regulations and Development norms**
- General building requirements and services including regulations for **high-rise buildings**
- Safety and security in building: **Fire safety, Structural Safety, Disaster management as per BIS Codes.**
- Adoption for Modern Construction Technology: **Safety and other provisions for High-rise Building regulations with Parking, Peripheral Open Spaces including set-backs.**
- Barrier Free Environment: **Provisions for Differently abled, Elderly and Children including Site development, Access Path/ Walk Way, Parking, Building requirements, Stair, Lifts, Toilets, Drinking Water, Refuge and signage.**
- Environmental Concerns: **Green Buildings and Sustainability provisions, Rainwater Harvesting, Wastewater Reuse and Recycle and installation of Solar Roof Top PV norms.**
- Sanitation requirements: **adequate toilet facilities for women and Public Conveniences in Public Buildings and Mandatory Provisions for Segregated toilet facilities for visitors in Public Buildings.**
- Exposure to IT enabled services of building permit: **Provision for Online Building plan approval process, generation of reports/approvals and integrated systems of intimation of approval, Compliance report from drawings for automatic generation of Completion certificate and integration of various clearances at Master Plan levels.**
- Effects of Communication Technology: **Guidelines for mitigation of Electro Magnetic Radiations in built. Guidelines for safe spacing of indoor and outdoor appliances and equipment.**
- Climate resilient construction : **integration of Environmental clearances with sanction**



At the end of the subject, students are required to go through a self-assessment process that helps them identify knowledge gaps and own development paths as well as the importance of peer interaction and reflective learning in team environments. In undertaking this subject students will understand the basic principles of building regulations and will have exposure to various national buildings codes and building bye laws.

This subject aims to give students an introduction to construction regulations including:

- relevant National and State government legislation and the National Building Code (NBC) of India, International Building Code
- relevant Model Building Byelaws of India
- relevant safety standards and detailing codes for structural safety
- relevant fire technology including fire science, fire statistics, causes of fire, fire prevention, fire containment, automatic fire detection, fire properties of materials, fire resistance levels, human movement and emergency egress, emergency warning systems, emergency lighting and controlling fire spread;
- an introduction to sustainable building practice in the context of the legislation, regulations standards and codes,

3.0 LEARNING OUTCOME

On completion of this subject the student is expected to develop a thorough understanding of all key competency areas in Building Regulations

The core objectives:

- To provide a fundamental understanding of the regulations pertaining to the planning and construction of buildings;
- Understand legislative controls that impact on the building industry including the design and construction process;
- Interpret and apply the National Building Code of India to simple buildings or designs;
- Display a knowledge of the community risks that impact on the building industry and an understanding of how those risks are managed at a policy and legislative level;
- To provide a fundamental understanding of the regulations pertaining to the safety in construction of buildings;
- Understand the nature and cause of fire in relation to the built environment and the principles of the discipline of fire safety engineering.
- Understand sustainable building practice in the context of the legislation, regulations standards and codes



4.0 GENERIC SKILLS

On successful completion of the subject students should have developed the following skills and capabilities:

- Professional / industry communication relating to construction regulation;
- Ability to read and interpret construction drawings and understand compliance to building regulations
- Ability to communicate construction solutions by means of sketches and drawings.
- Clear and succinct understanding of all the planning, construction and operational aspects of building construction
- Working in teams to collect and collate data on a real building;
- Analytical and problem solving skills;
- Strategic analysis of community risks and how to treat or solve them.

5.0 DETAILED SUBJECT SCHEDULE

Total contact period : 44 hours

Duration of Lecture : 1 Hour

Duration of tutorial : 3 hours

Table 1: Detailed subject schedule

Week	Lecture	Topic	Learning Activities
1	Lecture 1:	Subject introduction and requirements • What is Building Regulations or Building Code? • History of Development of Building Regulations	Reading list: BR-1-1(Essential) BR-1-1(Optional)
	Lecture 2:	Introduction to National Building Code (NBC) of India • Objectives and Applications of Building Regulations in constructions • Integrated approach for applying provisions of the code	Reading list: BR-2-1(Essential)
	Tutorial 1	Introduction to National Building Code (NBC) of India - Learning	Discussions/quiz etc. based on the contents of



Week	Lecture	Topic	Learning Activities
		applicability of Building Code for Construction Management	Essential Readings of Lecture 1 & 2.
2	Lecture 3:	Introduction to Model Building Bye Laws (MBBL) of India - Briefing about NBC & MBBL - Understanding applicability with case study	Reading list: BR-3-1(Essential) BR-3-1(Optional)
	Lecture 4:	Introduction to International Building Code Discussion on International Building Code	Reading list: BR-4-1(Essential) BR-4-1(Optional)
	Tutorial 2	Understanding Building Codes and Building Byelaws relationship – recommendatory and mandatory provisions	Discussions / quiz etc. based on the contents of Essential Readings of Lecture 3 & 4.
3	Lecture 5:	Building Regulation overview - Jurisdiction / applicability - Building documentation - Procedures	Reading list: BR-5-6-7-1 (Essential) BR-5-6-7-1 (Optional)
	Lecture 6:	Building Regulation overview - Definitions of terms - Procedure for obtaining building permit - New Permit and Renewal Process - Responsibilities and Duties of the owner	Reading list: BR-5-6-7-1 (Essential) BR-5-6-7-1 (Optional)
	Tutorial 3	Worked Examples and Reflections – Case study of a building project and understanding the documentation requirement and process (Lecture 5 & 6)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 5 & 6.
4	Lecture 7:	Building Regulation overview Procedure during Construction Work	Reading list: BR-5-6-7-1 (Essential)



Week	Lecture	Topic	Learning Activities
		- Drawings and Documents for construction - Statutory drawings, Permits and Working drawings	BR-5-6-7-1 (Optional)
	Lecture 8:	Building Regulation and Control - Requirement in respect of building sites - Inspection, occupancy permit - Post-occupancy inspection.	Reading list: BR-8-1(Essential) BR-8-1(Optional)
	Tutorial 4	Worked Examples and Reflections – Case study of a building project and understanding the documentation requirement and process (Lecture 7 & 8)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 7 & 8.
Assignment 1	Assignment 1	Building Regulations – Draft report due	
5	Lecture 9:	Development Control Regulations - Building Plans for Multi-Storeyed/Special Buildings, Setback Regulations - Understanding Land use Planning Permission / Zoning Regulations for Buildings	Reading list: BR-9-10-11-1 (Essential) BR-9-10-11-1 (Optional)
	Lecture 10:	Development Control Regulations - Development control rules and general building requirements to ensure health and safety of the public. - The limitation of area and height of buildings of different occupancy classes and types of construction	Reading list: BR-9-10-11-1 (Essential) BR-9-10-11-1 (Optional)
	Tutorial 5	Worked Examples and Reflections – Case study of a building project and understanding the documentation requirement and process (Lecture 9 & 10)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 9 & 10.



Week	Lecture	Topic	Learning Activities
6	Lecture 11:	Development Control Regulations • Building Height regulations, FAR, FSI, additional FAR, Purchasable FAR, Floating FAR • Understanding Parking norms for different building classifications	Reading list: BR-9-10-11-1 (Essential) BR-9-10-11-1 (Optional)
	Lecture 12:	Procedure and Compliance During Construction • Conformity to Building Code • Commencement of work • Drawings & Documents control at Site	Reading list: BR-12-13-1 (Essential) BR-12-13-1 (Optional)
	Tutorial 6	Individual Presentation on Case study of a building project and understanding compliances discussed from lecture 1-12	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 11 & 12.
7	Lecture 13:	Procedure and Compliance During Construction • Inspection of Building during Construction • Construction stage inspection and certifications	Reading list: BR-12-13-1 (Essential) BR-12-13-1 (Optional)
	Lecture 14:	General building requirements and services • Requirements for Parts of Buildings. • Special Requirements of Low Income Housing • Special Requirements for Cluster Planning for Housing • Group housing • Non-residential buildings	Reading list: BR-14-1(Essential) BR-14-1(Optional)
	Tutorial 7	Feedback session on Individual Presentation on Case study of the building project and	Discussions/quiz etc. based on the contents of



Week	Lecture	Topic	Learning Activities
		compliances discussed from lecture 1-12	Essential Readings of Lecture 13 & 14.
8	Lecture 15:	Requirements for fire prevention, life safety in relation to fire and fire protection of Buildings - Terminology - Introduction to Fire safety requirement - Fire prevention and safety requirements for Buildings Based on Occupancy	Reading list: BR-15-16-17-1 (Essential) BR-15-16-17-1 (Optional)
	Lecture 16:	Requirements for fire prevention, life safety in relation to fire and fire protection of Buildings - Fire Zones – demarcations into distinct zones, based on fire hazard inherent in the buildings and structures according to occupancy - Restrictions on the Type of Construction for New Buildings	Reading list: BR-15-16-17-1 (Essential) BR-15-16-17-1 (Optional)
	Tutorial 8	Worked Examples and Reflections – Case study of a building project including site visit and understanding the fire safety requirement and compliances	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
Assignment 2	Assignment 2	Peer Review of draft report of Assignment 1 (peer review report due)	
9	Lecture 17:	Requirements for fire prevention, life safety in relation to fire and fire protection of Buildings	Reading list: BR-15-16-17-1 (Essential)



Week	Lecture	Topic	Learning Activities
		- Fire Resistance Ratings of Structural and Non-Structural Elements (Hours) - Provisions of fire safety for occupation of buildings or part of the building during construction, repairs, alterations or additions	BR-15-16-17-1 (Optional)
	Lecture 18:	Fire protection and fire safety requirements in buildings - Procedure for clearance from fire service - Renewal of fire clearance - Fire Escapes or External Stairs - Provision of lifts - Service ducts/refuge chute - Electrical services - Staircase and corridor lights	Reading list: BR-18-19-20-1 (Essential) BR-18-19-20-1 (Optional)
	Tutorial 9	Worked Examples and Reflections – Case study of a building project including site visit and understanding the fire safety requirement and compliances	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
10	Lecture 19:	Fire protection and fire safety requirements in buildings - Air-conditioning - Alternate source of electric supply - Safety measures in electric sub-station. - Static water storage tank - Automatic sprinklers - Fixed carbon di-oxide /foam/dco water spray extinguishing system	Reading list: BR-18-19-20-1 (Essential) BR-18-19-20-1 (Optional)
	Lecture 20:	Fire protection and fire safety requirements in buildings	Reading list:



Week	Lecture	Topic	Learning Activities
		• Fire alarm system • Control Room • Fire drills and fire orders • Material used for construction of building • Liquefied Petroleum Gas (LPG) • House keeping • Fire prevention • Occupancy restrictions	Reading list: BR-18-19-20-1 (Essential) BR-18-19-20-1 (Optional)
	Tutorial 10	Worked Examples and Reflections – Case study of a building project including site visit and understanding the fire safety equipment.	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
11	Lecture21:	Special requirements for occupancy/land Development • Industrial Buildings (Factories, Workshops, etc.) • Educational Building (School/Colleges)	Reading list: BR-21-22-1 (Essential) BR-21-22-1 (Optional)
	Lecture22:	Special requirements for occupancy/land Development • Assembly Building (Cinema, Theatres, etc.) • Petrol filling station – ingress /	Reading list: BR-21-22-1 (Essential) BR-21-22-1 (Optional)
	Tutorial 11	Worked Examples and Reflections – Case study of a building project and understanding the special requirements.	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
12	Lecture 23:	Provisions for differently-abled, elderly and Children • Applicability	Reading list: BR-23-24-1 (Essential)



Week	Lecture	Topic	Learning Activities
		Guidelines and Provisions	BR-23-24-1 (Optional)
	Lecture 24:	Provisions for differently-abled, elderly and Children - Barrier free guidelines as notified by the Government - Appropriate signage - Public Building regulations	Reading list: BR-23-24-1 (Essential) BR-23-24-1 (Optional)
	Tutorial 12	Worked Examples and Reflections – Case study of a building project and understanding the Barrier free guidelines.	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
13	Lecture 25:	Provisions for Rainwater Harvesting in Buildings - Rain Water Harvesting provisions in various Building categories - Rain Water Harvesting Provisions for Open spaces around buildings in cities - Provision for Ground Water Recharge - Enforcement and Monitoring	Reading list: BR-25-1(Essential) BR-25-1(Optional)
	Lecture 26:	Green buildings and sustainability provisions Provisions and Applicability	Reading list: BR-26-27-28-1 (Essential) BR-26-27-28-1 (Optional)
	Tutorial 13	Worked Examples and Reflections – Case study of a building project and understanding the special requirements.	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.



Week	Lecture	Topic	Learning Activities
14	Lecture 27:	Green buildings and sustainability provisions - Provisions for Sanction - Various Guidelines for Green Rating systems	Reading list: BR-26-27-28-1 (Essential) BR-26-27-28-1 (Optional)
	Lecture 28:	Green buildings and sustainability provisions - Various Guidelines for Green Rating systems - GRIHA Compliances - IGBC Compliances	Reading list: BR-26-27-28-1 (Essential) BR-26-27-28-1 (Optional)
	Tutorial 14	Worked Examples and Reflections – Case study of a building project and understanding the special requirements.	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
15	Lecture 29:	Conservation of heritage sites including heritage Buildings, heritage precincts and natural feature Areas - Applicability - Responsibility of the owners of heritage buildings - Restrictions on development / re-development / repairs - Alteration / modification / relaxation in development norms - Penalties	Reading list: BR-29-1(Essential) BR-29-1(Optional)
	Lecture 30:	Climate resilient construction: integration of Environmental clearances with sanction. Environmental conditions for compliance during Building approvals	Reading list: BR-30-1(Essential) BR-30-1(Optional)



Week	Lecture	Topic	Learning Activities
	Tutorial 15	Brief discussion and example case study	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
16	Assignment 3	Building Regulations – Final Report due.	
	Group Discussions	Date and Topics TBA later	
	Final Presentations	Date and Topics TBA later	

6.0 PEDAGOGICAL APPROACH, ACTIVITIES

The pedagogical approach is based on classroom lectures of up to 1 hour duration twice a week during the course. The lectures will involve a range of teaching topics, which will include introduction and discussion of Building provisions and compliances. The teaching modes apart from classroom lectures will include tutorials on case study of various applications of Building Regulation, various group activities such as, group assignments, site visits, preparation of case studies, and guest presentations from professionals working on live projects to provide both specialist knowledge and the problems faced during management of projects in the real world. Seminars will be held every week so that each student can share their knowledge, ask questions and dive further in to the subject materials. The timings of the scheduled activities will be provided at the beginning of the course, depending on the annual academic calendar of the college.

7.0 ASSESSMENT

Assessment in this subject has both formative and summative aspects to it. The students will have an opportunity to provide formative feedback to their peers and receive constructive feedback in return, as well as from the subject coordinator. This will give them the opportunity to develop and improve on particular skills throughout the course of the subject.

There are five assessment tasks in this subject. The assessment tasks (class participation, assignment 1 to 3 and final presentation) mimic the activities that a student is most likely to undertake in a real situation. This task will be used to demonstrate that the student have developed the skills needed to assess complex Building Regulation related topics and possible solutions to improving their performance and communicate their findings in a professional context.



The students' main tasks will be to develop a project taking all the components like tendering, scheduling, resource mapping etc. and present it as a professional project report and an oral presentation. A summary of the marking scheme is provided in Table 2. Specific requirements for each task are provided in section 7.1 and 7.2.

7.1 Class Participation

The subject involves a range of activities and participation of the student is critical for achieving the learning outcome of the subject.

The assessment for this task will involve a number of in-class discussion, quizzes relating to content and preparation of software based project.

The students will be assessed on their ability to

- Understand and interpret the different components of Building Regulation discussed during seminars
- Respond appropriately to questions

7.2 Assignment (Example only – to develop for Indian Context)

7.2.1 Building Regulation report (draft)

This assignment is 25% of the overall subject mark. This project is to be completed by students working in groups of up to 4, please inform me of the names of the students in your group by the week 5 lecture.

The lectures during weeks 3 to 7 inclusive are designed to help you with this project and the issues involved.

Purpose

Learning outcomes and skills development

This assignment aims to give you experience of research, analysis, evaluation and interpretation of the Building Code of Australia as well as improving your building survey and recording skills.

You will gain an understanding of the matters covered in the Building Code of Australia 2016 and safety and fire legislation compliance in Victoria in commercial buildings.

Brief

The University of Melbourne owns and manages a significant number of properties on all its campuses. Overtime these buildings may no longer meet the current requirements of the BCA in Victoria (or whatever legislation, if any, these buildings were originally constructed to comply with).

Given the open and public access to many of these buildings the University, as part of risk management strategy, needs an update on its buildings to ensure none are potentially unsafe to students, staff and the public. As part of its review of overall compliance, the University has requested that the Doug



McDonell building be 'surveyed' against the Building Code of Australia 2016 Deemed-to-Satisfy Provisions.

You are required to inspect the building. Note: do not enter staff offices, nor any areas where students are not usually allowed access to, including plant-rooms. You will be required to inspect all common areas, stairs and corridors, WC facilities, and any open access spaces such as lecture theatres and classrooms.

You should apply the BCA as follows;

➤ Step 1

Determine the classification of the building (Part A3, Classes 1 – 10).

Note: Include review of BCA Clause A3.3 and Regulation 112 of the Building Regulations 2006 (you are to consider yourself the 'relevant building surveyor' for the purposes of Regulation 112).

➤ Step 2

Determine the "rise in storeys" of the building (Part C1).

Note: Check if any basement area is a BCA basement [BCA Clause C1.2(b)(ii)], or is included in the 'rise in storeys'. Check whether any mezzanines are BCA defined mezzanines, or storeys.

➤ Step 3

Establish the "type of construction" from Table C1.1.

➤ Step 4

Check maximum compartment or atrium size is not exceeded (Table C2.2), otherwise type of construction might change and/or fire compartments may be required.

Calculate the overall floor area and volume and discuss how the atrium space influences this analysis. Comment on the total floor area and volume of the building.

➤ Step 5

Determine fire resistance levels of all building elements from the type of construction tables.

➤ Step 6

Check the 'effective height' as defined in the BCA

Additional provisions apply to buildings that exceed 12m in effective height (room for a stretcher in a lift, if a lift is provided), 25 m in effective height (sprinklers, smoke control, emergency lift to be provided and other requirements), and 50 m in effective height (fire control room must be provided). You only need to specify the 'effective height'. The outcomes of this will be reviewed in assignment 2.



- *You are required to produce a professional report to your client outlining where the existing building does not meet the BCA 2016 requirements. Your report must cover the sections of the BCA included in the attached table only.*
- *Your report will need to include an introduction, a conclusion and an executive summary. The executive summary is to be 1 side of A4 maximum in length. The entire report is to be no longer than 20 pages in length (including appendices).*

A sample table is included at the end of this document and can be used for the assignment.

Submission Deadline

 before 4pm. Marked work will be handed back 2 weeks later. Note: The University rules for late submission apply.

Assessment criteria will include:

- *Logical structure to report and use of best report writing practice (20%)*
- *Clear and comprehensive written report to demonstrate areas of non-compliance with BCA Volume 1, 2016 (80%).*

Required reference material:

NBC 2016 , MBBL 2016

Report format

The report should be presented in A4 format with margins of 2.50m in each side and the pages numbered. The line spacing should be 1.50 cm. Both sides of the page should be utilized for printing.

Heading, tables, diagrams are to be used and appropriately numbered. An abstract or executive summary at the beginning of the report is to be included (which will include key findings and recommendations). A 100 word summary by each member reflecting on the individual contributions, overall understanding and development of planning and programming skills in the assignments.

There is no page limit as such for the report, but it should be approximately 5000 words in length (excluding tables, diagrams and references)

Use of references to existing research/literature in order to support the argument of the report is to be included and properly referenced. The Harvard referencing format (i.e. Author (year)) should be used to cite specific references and all the references should be referred to in a 'References' section at the end of the report. The students must use consistent and professional formatting styles. They need to have table of contents



showing only the first two levels of headings. The appearance of the report must be professional, clean, and consistent from start to end.

The students are advised to refer to online skill development courses provided by www.coursera.org to get a better idea of how to put their ideas to words. The following links may be useful for the students

<https://www.coursera.org/learn/business-writing>

<https://www.coursera.org/specializations/academic-english>

Submission – Draft Report

The students are required to submit a draft of their report in week 4. The draft report should, as a minimum be structured and formatted as it is planned to present the final report. As a minimum the student should include a table of contents, type of project selected, identification of client, short description of the project, relevant information about the organisation's recent history, mission and goals, circumstances and problems leading to the currently proposed project work already carried out in the area of the proposed project and stakeholders in the projects.

The Draft Report should not provide any identifying details (name, enrolment number etc) that could be used to identify the student, as the peer review process will be anonymous.

Submit your draft report in print form with proper spiral bind.

7.2.2 Peer Review

Students are required to critically review one of their colleagues' Building Regulation Draft Reports and provide constructive feedback on how they might be improved. The review should be approximately between 500-1000 words. Primary focus should be on the strengths and weakness of the peer's draft report and how well they address the requirement of for developing a project.

The peer review should focus on making suggestions to help the peer further develop and improve their report.

Peer review assessment criteria

The student will be assessed in his ability to:

- Demonstrate an understanding of the broad principles of Building Regulation
- Apply that understanding to the analysis and critique of the peer's draft report.
- Critically evaluate the work of peer's and provide constructive feedback.
- To use skill and sensitivity in providing formative (constructive) feedback to peers.



The peer feedback of a draft report of a student will be provided to the student after the completion of the process i.e. by Week 8.

7.2.3 Submission-final report

The final report should be submitted in printed form after considering and incorporating the suggestions made in the peer review comments (if any).

Reports submitted after the due date will incur a 10 % penalty of the available marks in that section, unless prior application for special consideration has been submitted and approved.

Final Report Assessment Criteria (to develop) Example only

Assignment No 2: Building upgrade to BCA requirements.

This assignment is 15% of the overall subject mark. This project is to be completed by individual students.

Learning outcomes and skills development

This assignment aims to give you experience of research, analysis, evaluation and interpretation of the Building Code of Australia, as well as improving your building surveying skills.

You will gain an understanding of the matters covered in the Building Code of Australia.

Brief

The University of Melbourne owns and manages a significant number of properties on all its campuses. As part of its review of overall compliance, the University has requested that the Doug McDonnell building be 'surveyed' against the Building Code of Australia 2016 Deemed-to-Satisfy Provisions. A copy of the plans of the building were provided for Assignment No. 1, and are on LMS.

This assignment comprises Stage 2 of the project.

1. The following systems have been determined as not complying with the Deemed-to-Satisfy Provisions of the BCA and the University is considering a voluntary upgrade to meet the BCA DtS Provisions. You are to describe what work is required to upgrade these systems:

□ BCA Part D3 and Clause F2.4, disabled access and facilities (50 marks)

You need only consider the following clauses; D3.2, D3.3, D3.4, D3.6, D3.7, D3.8 & Section 15 of AS 1428.1-2009.

You do not need to consider cost. You should present the outcomes in a report describing the analysis and what is required for this building. This report should not exceed 2 pages. Details on how to access Australian Standards via the University library was previously provided on LMS.

2. The spacing between balusters in the balustrading within the existing fire-isolated stair has also been determined as not complying with the BCA DtS requirements of D2.16(c) and Item 2(a) of Table D2.16(a) as the stair is not *used primarily for emergency purposes*. You are to consider the methodology in the BCA (extracted below) and decide if this existing spacing *could be determined as satisfying the BCA as a 'Performance Solution'*. This Performance Solution should not exceed 4 pages in length (50 marks)

Extract from the 'documentation of decisions' part of the Introduction to the BCA:

Examples of the kind of documentation which should be prepared and retained include:

(a) Details of the Building Solution including all relevant plans and other supporting



documentation.

(b) In cases where a Performance Solution has been proposed—

(i) details of the relevant Performance Requirements; and

(ii) the Assessment Method or methods used to establish compliance with the relevant Performance Requirements; and

(iii) details of any Expert Judgement relied upon including the extent to which the judgement was relied upon and the qualifications and experience of the expert; and

(iv) details of any tests or calculations used to determine compliance with the relevant Performance Requirements; and

(v) details of any Standards or other information which were relied upon.

Submission Deadline

By midnight, _____. Note: The University rules for late submission apply.

Assessment criteria will include:

☐ Logical structure to report and use of best report writing practice (20%)

☐ Clear and comprehensive written report to demonstrate knowledge of the BCA (80%).

If you have any queries, or need assistance to clarify any BCA or building matters, you can attend the tutorial classes, or contact me by email or phone.

7.2.4 Final Presentation

The student will present the major findings from his/her final report to the panel members (coordinator and invited reviewers). The ideas that have been identified have to be presented.

Format

The presentation should be addressed to the panel members, as a project proposal for implementation. The student is welcome to present in an own format, but it has to be remembered that the format maximizes the exposure to the content of the presentation.

Presentation : 15 minutes followed by Q&A : 5 minutes

Assessment Criteria

The presentation will be assessed by the panel members on the way of presentation and communication skills and how well a student is able to convince the panel members and taking care of the different components of the designed project.

Presentation date: Week 10.

Students are required to be available for the entire week. The time of presentation will be advised at a later date.



7.3 Marking Scheme – to be as per University Regulation followed by AEC

Table 2 provides the detailed marking scheme in this subject.

Table 2: Summary of Assessment Tasks and Marking scheme

Assessment category	Brief Discussion	Weight (%)	Pass (%)	To pass, a student has to	
				obtain a minimum marks of	Out of
Class participation	Participation in weekly activities and active involvement in class discussion	10	4	8	20
Assignment 1 (Building Regulation-Draft)	See Below	10	4	8	20
Assignment 2 (Peer Review)	Review of peer report (1000 words)	10	4	8	20
Assignment 3 (Building Regulation Final)	Professional report outlining as assessment of Building Regulation and suggestions for improvement (5000 words)	10	4	8	20
Final Presentation	Presentation of report findings and recommended improvements	10	4	8	20
End semester exam	Theory based	50	20	40	100
Total	--	100	40	80	200

The students will have to appear in an end semester examination (as per the guidelines of the University under which AEC is affiliated) which will be subjective in nature. A minimum mark of 40% (each assessment category) must be achieved in the examination in order to pass the subject. The assignments/ presentations can be re-submitted in a semester if a student fails to score the requisite pass marks. However,

if a student fails to achieve 40 % marks in the theory exam he will be deemed to fail in the subject and will have to clear in the next attempt.

8.0 REQUIRED READING

Students are expected to refer to various building operations and services related topics from various sources, which might include case studies, conferences papers, library collections, eBooks and eJournals. A list of essential and optional reading is provided in Table – 3, Section 13.

9.0 REQUIRED TEXTS

[illegible]

10.0 ATTENDANCE POLICY

The attendance policy is as per the standard university guidelines (under which AEC is affiliated).

11.0 PLAGIARISM, COLLUSION AND CONSEQUENCES

Merriam-Webster's online dictionary explains that **Plagiarism** is the act of stealing and passing off (the ideas or words of another) as one's own; or using another's production without crediting the source; or to commit literary theft i.e. to present as new and original an idea or product derived from an existing source.

Collusion is the presentation by a student of an assignment as his or her own which is in fact the result in whole or part of unauthorised collaboration with another person or persons.

In any case where a student has been involved in plagiarism or collusion in an assessable assignment on task the marks awarded for that will be zero, and no substitution of an alternative task will normally be permitted.

12.0 READING LIST

The reading list (as provided in Table 3) provides the literature that a student is expected to go through to understand the various state of practice in the field of Fundamentals of Project Managements. The literature marked 'ESSENTIAL' consists of a published literature which is a must read for the students. However this list is not an extensive one and may be updated and altered as and when necessary. Students



are encouraged to come up with suggested literature in this field for discussion in or off the class.

Table 3: Reading List: Building Regulation

Reading	Topic	Reference	Suggested Literature
BR-1-1	Subject introduction and requirements • What is Building Regulations or Building Code? • History of Development of Building Regulations	Lecture 1	NATIONAL BUILDING CODE OF INDIA FOREWORD & PART 0
BR-2-1	Subject introduction and requirements • Objectives and Applications of Building Regulations in constructions • Integrated approach for applying provisions of the code	Lecture 2	NATIONAL BUILDING CODE OF INDIA PART 2 ADMINISTRATION
BR-3-1	Introduction to Model Building Bye Laws (MBBL) of India • Briefing about NBC & MBBL • Understanding applicability with case study	Lecture 3	MODEL BUILDING BYE-LAWS 2016 PRELUDE SECTION 2. JURISDICTION/APPLICABILITY AND BUILDING DOCUMENTATION PROCEDURES - INTRODUCTION
BR-4-1	Introduction to International Building Code • Discussion on International Building Code	Lecture 4	INTERNATIONAL BUILDING CODE ABOUT ICC GENERAL APPLICABILITY
BR-5-6-7-1	Building Regulation overview • Jurisdiction / applicability • Building documentation • Procedures	Lecture 5	NATIONAL BUILDING CODE OF INDIA PART 2 ADMINISTRATION SECTION 1 SECTION 2 SECTION 3 MODEL BUILDING BYE-LAWS 2016



Reading	Topic	Reference	Suggested Literature
			SECTION 2. JURISDICTION/APPLICABILITY AND BUILDING DOCUMENTATION PROCEDURES - INTRODUCTION
BR-5-6-7-1	Building Regulation overview • Definitions of terms • Procedure for obtaining building permit • New Permit and Renewal Process • Responsibilities and Duties of the owner	Lecture 6	NATIONAL BUILDING CODE OF INDIA PART 1 DEFINITION PART 3 DEVELOPMENT CONTROL – INTRODUCTION MODEL BUILDING BYE-LAWS 2016 SECTION 3. DEVELOPMENT CODE
BR-5-6-7-1	Building Regulation overview • Procedure during Construction Work • Drawings and Documents for construction • Statutory drawings, Permits and Working drawings	Lecture 7	NATIONAL BUILDING CODE OF INDIA PART 3 DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIREMENTS MODEL BUILDING BYE-LAWS 2016 SECTION 3. DEVELOPMENT CODE
BR-8-1	Building Regulation and Control • Requirement in respect of building sites • Inspection, occupancy permit • Post-occupancy inspection.	Lecture 8	NATIONAL BUILDING CODE OF INDIA PART 3 DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIREMENTS MODEL BUILDING BYE-LAWS 2016 SECTION 3. DEVELOPMENT CODE SECTION 4. GENERAL BUILDING REQUIREMENTS AND SERVICES
BR-9-10-11-1	Development Control Regulations • Building Plans for Multi-Storeyed/Special Buildings, Setback Regulations	Lecture 9	NATIONAL BUILDING CODE OF INDIA PART 3 DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIREMENTS



Reading	Topic	Reference	Suggested Literature
	Understanding Land use Planning Permission / Zoning Regulations for Buildings		MODEL BUILDING BYE-LAWS 2016 SECTION 3. DEVELOPMENT CODE 4. GENERAL BUILDING REQUIREMENTS AND SERVICES 5. PROVISIONS FOR HIGH RISE DEVELOPMENT
BR-9-10-11-1	Development Control Regulations - Development control rules and general building requirements to ensure health and safety of the public. - The limitation of area and height of buildings of different occupancy classes and types of construction	Lecture 10	NATIONAL BUILDING CODE OF INDIA PART 3 DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIREMENTS MODEL BUILDING BYE-LAWS 2016 SECTION 3. DEVELOPMENT CODE
BR-9-10-11-1	Development Control Regulations - Building Height regulations, FAR, FSI, additional FAR, Purchasable FAR, Floating FAR - Understanding Parking norms for different building classifications	Lecture 11	NATIONAL BUILDING CODE OF INDIA PART 3 DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIREMENTS MODEL BUILDING BYE-LAWS 2016 SECTION 3. DEVELOPMENT CODE
BR-12-13-1	Procedure and Compliance During Construction - Conformity to Building Code - Commencement of work - Drawings & Documents control at Site	Lecture 12	NATIONAL BUILDING CODE OF INDIA PART 3 DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIREMENTS MODEL BUILDING BYE-LAWS 2016 SECTION 3. DEVELOPMENT CODE
BR-12-13-1	Procedure and Compliance During Construction - Inspection of Building during Construction - Construction stage inspection and certifications	Lecture 13	NATIONAL BUILDING CODE OF INDIA PART 7 CONSTRUCTIONAL PRACTICES AND SAFETY – INTRODUCTION MODEL BUILDING BYE-LAWS 2016 SECTION 3. DEVELOPMENT CODE



Reading	Topic	Reference	Suggested Literature
BR-14-1	General building requirements and services • Requirements for Parts of Buildings. • Special Requirements of Low Income Housing • Special Requirements for Cluster Planning for Housing • Group housing • Non-residential buildings	Lecture 14	NATIONAL BUILDING CODE OF INDIA PART 3 DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIREMENTS
BR-15-16-17-1	Requirements for fire prevention, life safety in relation to fire and fire protection of Buildings • Terminology • Introduction to Fire safety requirement • Fire prevention and safety requirements for Buildings Based on Occupancy	Lecture 15	NATIONAL BUILDING CODE OF INDIA PART 4 – FIRE AND LIFE SAFETY
BR-15-16-17-1	Requirements for fire prevention, life safety in relation to fire and fire protection of Buildings • Fire Zones – demarcations into distinct zones, based on fire hazard inherent in the buildings and structures according to occupancy • Restrictions on the Type of Construction for New Buildings	Lecture 16	NATIONAL BUILDING CODE OF INDIA PART 4 – FIRE AND LIFE SAFETY MODEL BUILDING BYE-LAWS 2016 SECTION -11 FIRE PROTECTION AND FIRE SAFETY REQUIREMENTS
BR-15-16-17-1	Requirements for fire prevention, life safety in relation to fire and fire protection of Buildings • Fire Resistance Ratings of Structural and Non-Structural Elements (Hours) • Provisions of fire safety for occupation of buildings or part of the building during	Lecture 17	NATIONAL BUILDING CODE OF INDIA PART 4 – FIRE AND LIFE SAFETY MODEL BUILDING BYE-LAWS 2016 SECTION -11 FIRE PROTECTION AND FIRE SAFETY REQUIREMENTS



Reading	Topic	Reference	Suggested Literature
	construction, repairs, alterations or additions		
BR-18-19-20-1	Fire protection and fire safety requirements in buildings • Procedure for clearance from fire service • Renewal of fire clearance • Fire Escapes or External Stairs • Provision of lifts • Service ducts/refuge chute • Electrical services • Staircase and corridor lights	Lecture 18	NATIONAL BUILDING CODE OF INDIA PART 4 – FIRE AND LIFE SAFETY MODEL BUILDING BYE-LAWS 2016 SECTION -11 FIRE PROTECTION AND FIRE SAFETY REQUIREMENTS
BR-18-19-20-1	Fire protection and fire safety requirements in buildings • Air-conditioning • Alternate source of electric supply • Safety measures in electric sub-station. • Static water storage tank • Automatic sprinklers • Fixed carbon di-oxide /foam/dco water spray extinguishing system	Lecture 19	NATIONAL BUILDING CODE OF INDIA PART 4 – FIRE AND LIFE SAFETY MODEL BUILDING BYE-LAWS 2016 SECTION -11 FIRE PROTECTION AND FIRE SAFETY REQUIREMENTS
BR-18-19-20-1	Fire protection and fire safety requirements in buildings • Fire alarm system • Control Room • Fire drills and fire orders • Material used for construction of building • Liquefied Petroleum Gas (LPG) • House keeping • Fire prevention • Occupancy restrictions	Lecture 20	NATIONAL BUILDING CODE OF INDIA PART 4 – FIRE AND LIFE SAFETY MODEL BUILDING BYE-LAWS 2016 SECTION -11 FIRE PROTECTION AND FIRE SAFETY REQUIREMENTS
BR-21-22-1	Special requirements for occupancy/land Development • Industrial Buildings (Factories, Workshops, etc.) • Educational Building (School/Colleges)	Lecture 21	NATIONAL BUILDING CODE OF INDIA MODEL BUILDING BYE-LAWS 2016 SECTION -7 SPECIAL REQUIREMENTS FOR OCCUPANCY/LAND DEVELOPMENT AND OTHER



Reading	Topic	Reference	Suggested Literature
BR-21-22-1	Special requirements for occupancy/land Development • Assembly Building (Cinema, Theatres, etc.) • Petrol filling station – ingress /	Lecture 22	NATIONAL BUILDING CODE OF INDIA MODEL BUILDING BYE-LAWS 2016 SECTION -7 SPECIAL REQUIREMENTS FOR OCCUPANCY/LAND DEVELOPMENT AND OTHER
BR-23-24-1	Provisions for differently-abled, elderly and Children • Applicability • Guidelines and Provisions	Lecture 23	NATIONAL BUILDING CODE OF INDIA MODEL BUILDING BYE-LAWS 2016 SECTION-8 PROVISIONS FOR DIFFERENTLY-ABLED, ELDERLY AND CHILDREN
BR-23-24-1	Provisions for differently-abled, elderly and Children • Barrier free guidelines as notified by the Government • Appropriate signage • Public Building regulations	Lecture 24	NATIONAL BUILDING CODE OF INDIA MODEL BUILDING BYE-LAWS 2016 SECTION-8 PROVISIONS FOR DIFFERENTLY-ABLED, ELDERLY AND CHILDREN
BR-25-1	Provisions for Rainwater Harvesting in Buildings • Rain Water Harvesting provisions in various Building categories • Rain Water Harvesting Provisions for Open spaces around buildings in cities • Provision for Ground Water Recharge • Enforcement and Monitoring	Lecture 25	NATIONAL BUILDING CODE OF INDIA MODEL BUILDING BYE-LAWS 2016 SECTION – 9 RAINWATER HARVESTING
BR-26-27-28-1	Green buildings and sustainability provisions • Provisions and Applicability • Provisions for Sanction	Lecture 26	MODEL BUILDING BYE-LAWS 2016 SECTION 10 - GREEN BUILDINGS AND SUSTAINABILITY PROVISIONS



Reading	Topic	Reference	Suggested Literature
	• Various Guidelines for Green Rating systems		
BR-26-27-28-1	Green buildings and sustainability provisions • Provisions and Applicability • Provisions for Sanction • Various Guidelines for Green Rating systems	Lecture 27	MODEL BUILDING BYE-LAWS 2016 SECTION 10 - GREEN BUILDINGS AND SUSTAINABILITY PROVISIONS
BR-26-27-28-1	Green buildings and sustainability provisions • Provisions and Applicability • Provisions for Sanction • Various Guidelines for Green Rating systems	Lecture 28	MODEL BUILDING BYE-LAWS 2016 SECTION 10 - GREEN BUILDINGS AND SUSTAINABILITY PROVISIONS
BR-29-1	Conservation of heritage sites including heritage Buildings, heritage precincts and natural feature Areas • Applicability • Responsibility of the owners of heritage buildings • Restrictions on development / re-development / repairs • Alteration / modification / relaxation in development norms • Penalties	Lecture 29	NATIONAL BUILDING CODE OF INDIA MODEL BUILDING BYE-LAWS 2016 SECTION -12 CONSERVATION OF HERITAGE SITES INCLUDING HERITAGE BUILDINGS, HERITAGE PRECINCTS AND NATURAL FEATURE AREAS
BR-30-1	Climate resilient construction: integration of Environmental clearances with sanction. • Environmental conditions for compliance during Building approvals	Lecture 30	NATIONAL BUILDING CODE OF INDIA MODEL BUILDING BYE-LAWS 2016 SECTION - 14 CLIMATE RESILIENT CONSTRUCTION: INTEGRATION OF ENVIRONMENTAL CLEARANCES WITH SANCTION



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For any query, please don't hesitate to contact me over phone or email.

The study materials for the entire subject have been developed and will be available electronically.



MASTER OF CONSTRUCTION MANAGEMENT
ASSAM ENGINEERING COLLEGE
GUWAHATI-781013

BUILDING CONSTRUCTION
(SUBJECT GUIDE)

(Version-1.0)
Developed by – Dr. Bipul Talukdar



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1.0 INTRODUCTION

Building is essential part of human life. Buildings are used in different purposes like residential, commercial etc. Depending on the type of the building, the construction requirements are different. But, components of a building are almost similar to every type of building. The subject covers study on different component parts of a building. This subject guide helps the intended student and other readers to understand the basic objectives of this subject and how the students will be assessed during and after the completion of the course.

2.0 OVERVIEW & OBJECTIVES OF THE SUBJECT

This subject provides an introduction to the construction of buildings with an emphasis on residential and industrial construction. The key functions and performance requirements for the main elements are discussed in relation to material selection, structural design and construction methods. The aim here is to expose students to appreciate how construction techniques, contemporary practice, building legislation, advancements in materials technology are interlinked and all come together to influence the construction of buildings. The subject also includes an introduction to use of LGS in building construction and concept of green building.

3.0 LEARNING OUTCOMES

This subject will develop the following program learning outcomes.

On successful completion, students should be able to:

- Understand functional requirements of a building and primary properties it needs to serve.
- Develop knowledge on different types of buildings like residential and commercial and their basic requirements.
- Develop and understand the different components of a building.
- Develop understanding on how to select appropriate material for a building component and their design principles.
- Develop knowledge on building repair, maintenance, retrofitting and strengthening.
- Understand new technologies including energy efficient building construction and light gauge steel structures.

4.0 GENERIC SKILLS

On completion of the subject students should have developed the following skills and capabilities:



- Ability to understand functional requirements of a building and primary properties it needs to serve.
- Gather knowledge on different types of buildings like residential and commercial and their basic requirements.
- Gather knowledge and ability to understand the different components of a building.
- Develop knowledge on how to select appropriate material for a building component and their design principles.
- Develop knowledge on building repair, maintenance, retrofitting and strengthening.
- Acquire knowledge on new technologies including energy efficient building construction and light gauge steel structures.

5.0 DETAILED SUBJECT SCHEDULE

Total contact period: 41 hours
Duration of Lecture: 1 Hour
Duration of Tutorial: 1 hours

Table 1: Detailed subject schedule

Week No.	Lecture	Topic	Learning Activities
1	Lecture 1:	• Functional Requirements of a Building: Strength, Stability, Comforts, Convenience, Daylight, Ventilation. • Types of Building: As per construction procedure (timber, RCC etc.) and use (residential, commercial)	Reading list: BC-L1 (Essential)
	Lecture 2:	Introduction to Building Regulations and General Building Requirements.	Reading list: BC-L2 (Essential)
	Lecture 3:	Multi-Hazard Risk Analysis of Buildings • Flood • Earthquake, Liquefaction and landslides • Wind and Fire • Lightning and Intruder	Reading list: BC-L3.1 (Essential) BC-L3.2 (Essential)
2	Tutorial 1:	Worked Examples and Reflections (Lecture 1,2,&3)	Discussions/quiz etc. based on the contents of Essential



			Readings of Lecture 1,2 & 3.
	Lecture 4:	Site analysis, Soils and Soil reports	Reading list: BC-L4-5.1 BC-L4-5.2 (Essential)
	Lecture	Topic	Learning Activities
	Lecture 5:	Different Types of Building Foundations - Shallow Foundation - Deep Foundation	Reading list: BC-L4-5.1 BC-L4-5.2 (Essential)
3	Tutorial 2:	Worked Examples and Reflections (Lecture 4&5)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 4 & 5.
	Lecture 6:	Structural Members of a building and their design principles.	Reading list: BC-L6-7 (Essential)
	Lecture 7:	Structural Members of a building and their design principles.	
4	Tutorial 3:	Worked Examples and Reflections (Lecture 6 & 7)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 6 & 7.
	Lecture 8:	Masonry construction in Building Brick Masonry,	Reading list: BC-L8-9 (Essential)
	Lecture 9:	- Stone Masonry - Mortar Joints and Bonds - Plastering and Pointing Works.	
	Assignment 1	Submission of Assignment 1	
5	Tutorial 4:	Worked Examples and Reflections (Lecture 8 & 9)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 8 & 9.
	Lecture 10:	Reinforced Cement Concrete in Building Construction - Materials - Workmanship - Special Requirements of	Reading list: BC-L10-11 (Essential)



		Concrete	
	Lecture 11:	General Design Considerations	
6	Tutorial 5:	Worked Examples and Reflections (Lecture 10 & 11)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 10 & 11.
	Lecture	Topic	Learning Activities
	Lecture 12:	Floor System in a Building • Selection of floor type • Different flooring materials • Laying of flooring materials.	Reading list: BC-L12-13-14
	Lecture 13:	Windows in a Building Selection of Type, Size, Material and Arrangement.	
7	Lecture 14:	Doors in a Building Selection of Type, Size, Material and Arrangement.	
	Tutorial 6:	Worked Examples and Reflections (Lecture 12, 13 & 14)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 12, 13 & 14.
	Lecture 15:	Roofing System • Materials of Roofing System • Key Design Considerations • Maintenance • Reroofing	Reading list: BC-L15
8	Lecture 16:	Fundamentals of post tensioned concrete design in Buildings	Reading list: BC-L16.1 BC-L16.2
	Tutorial 7:	Worked Examples and Reflections (Lecture 15&16)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15&16.
	Lecture 17:	Industrial Buildings	Reading list: BC-L17-18.1 BC-L17-18.2 BC-L17-18.3
9	Lecture 18:	Industrial Buildings	
	Tutorial 8:	Worked Examples and Reflections (Lecture 17&18)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 17&18.
	Lecture 19:	Prefabricated Building	Reading list:



10	Lecture 20:	Prefabricated Building	BC-L19-20
	Tutorial 9:	Worked Examples and Reflections (Lecture 19&20)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 19&20.
	Assignment 2	Draft Submission of Assignment 2	
	Lecture 21:	Pre-engineered Building	Reading list: BC-L21-22.1 BC-L21-22.2 BC-L21-22.3 BC-L21-22.4
11	Lecture 22:	Pre-engineered Building	
	Tutorial 10:	Worked Examples and Reflections (Lecture 21&22)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 21&22.
	Lecture 23:	Green Building Construction	Reading list: BC-L23-24.1 BC-L23-24.2
	Lecture 24:	Green Building Construction	
12	Tutorial 11:	Worked Examples and Reflections (Lecture 23&24)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 23&24.
	Lecture 25:	Construction Practices & Safety • Construction Practices • Storage, Stacking & Handling • Safety in Construction site	Reading list: BC-L25-26.1 BC-L25-26.2 BC-L25-26.3
	Assignment 2	Return of review report to students.	
	Lecture 26:	• Maintenance, Repair, Retrofit and Strengthening of Building.	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 25&26.
13	Tutorial 12:	Worked Examples and Reflections (Lecture 25&26)	
	Lecture 27:	Safety in Demolition of Buildings	BC-L27
14	Lecture 28:	Landscaping, Signs and Outdoor display structure	BC-L28
	Tutorial 13:	Worked Examples and Reflections (Lecture 27&28)	Discussions/quiz etc.



			based on the contents of Essential Readings of Lecture 27&28.
	Assignment 2	Final Submission of Assignment 2	

6.0 PEDAGOGICAL APPROACH, ACTIVITIES

The pedagogical approach is based on classroom lectures of up to 1 hour duration twice a week during the course. The lectures will involve a range of teaching topics, which will include theoretical background on building construction. The teaching modes apart from classroom lectures will include various group activities such as, group tasks, site visits, preparation of case studies, evaluation of existing building construction technologies in terms of their performance, and guest presentations from industry professionals on specific topics to provide both specialist knowledge and state of the practice to give an insight to real world issues. Seminars will be held every week so that each student can share their knowledge, ask questions and dive further in to the subject materials.

The timings of the scheduled activities will be provided at the beginning of the course, depending on the annual academic calendar of the college.

7.0 ASSESSMENT

Assessment in this subject has both formative and summative aspects to it. The students will have an opportunity to provide formative feedback to their peers and receive constructive feedback in return, as well as from the subject coordinator. This will give them the opportunity to develop and improved on particular skills throughout the course of the subject.

There are five assessment tasks in this subject. The assessment tasks (class participation, assignment 1 to 3 and final presentation) mimic the activities that a student is most likely to undertake in a real situation. This task will be used to demonstrate that the student has developed the skills needed to understand the behaviour of appropriate type of material.

The students' main tasks will be to identify appropriate type of material, study different characteristics and present their findings in a professional report and an oral presentation. A summary of the marking scheme is provided in Table 2. Specific requirements for each task are provided in section 7.1 and 7.2.



7.1 Class participation

The subject involves a range of activities and participation of the student is critical for achieving the learning outcome of the subject. The assessment for this task will involve a number of in-class discussion and quizzes relating to content covered during tutorials. The students will be assessed on their ability to

- Understand and interpret themes discussed during seminars
- Respond appropriately to questions.

7.2 Assignment

Two separate individual assignments are required to be completed as part of the assessment. All assignments should have a cover sheet attached and to be handed in to instructor at the specified time as mentioned.

Assignment 1 – Involves understanding the basic principles of construction. This is meant to help students demonstrate their understanding of key elements in a building, namely: Building envelope, Building Structure and Building services. Assignment 1 is due in Week 4.

Assignment 2 – The assignment involves monitoring the progress of a residential building (or buildings) under construction. Students may work in groups up to 4 for the site visits only. Assignment reports are to be prepared individually using own photos. Assignment 2 is due in Week 10.

The exact structure of the report is up to the student, but the student should attempt to address the following areas in his/her report.

- Building type
- Building elements and their material and design principles
- Appropriateness of each of the building components in context of location of building, climatic condition, socio-cultural habit of building user, energy efficiency, sustainability of materials used.
- Students should report the improvement of building construction technology over the existing one.

Report format

The report should be presented in A4 format with margins of 2.50m in each side and the pages numbered. The line spacing should be 1.50 cm. Both sides of the page should be utilized for printing.

Heading, tables, diagrams are to be used and appropriately numbered. An abstract or executive summary at the beginning of the report is to be included (which will include key findings and recommendations). There is no page limit as



such for the report, but it should be approximately 5000 words in length (excluding tables, diagrams and references)

Use of references to existing research/literature in order to support the argument of the report is to be included and properly referenced. The Harvard referencing format (i.e. Author (year)) should be used to cite specific references and all the references should be referred to in a 'References' section at the end of the report.

The students are advised to refer to online skill development courses provided by www.coursera.org to get a better idea of how to put their ideas to words. The following links may be useful for the students
<https://www.coursera.org/learn/business-writing>
<https://www.coursera.org/specializations/academic-english>

Submission – Draft Report

The students are required to submit a draft of their assignment 2 report in week 10. The draft report should, as a minimum be structured and formatted as it is planned to present the final report. It should include all the items as mentioned in clause 7.2

The Draft Report should not provide any identifying details (name, enrolment number etc) that could be used to identify the student, as the peer review process will be anonymous. Submit your draft report in print form with proper spiral bind.

7.2.1 Peer Review

Students are required to critically review one of their colleagues' draft reports and provide constructive feedback on how they might be improved. The review should be approximately between 500-1000 words. Primary focus should be on the strengths and weakness of the peer's draft report and how well they address the requirement of the task across the following criteria.

- Abstract / Executive summary
- Table of contents provided
- Building type
- Building elements and their material and design principles
- Appropriateness of each of the building components in context of location of building, climatic condition, socio-cultural habit of building user, energy efficiency, sustainability of materials used.
- Improvement of building construction technology over the existing one.
- Presented in a concise, professional and well-structured manner.
- Integration of references to relevant literature.



The peer review should focus on making suggestions to help the peer further develop and improve their report.

Peer review assessment criteria

The student will be assessed in his ability to:

- Demonstrate a complete understanding on the subject matter.
- Apply that understanding to the analysis and critique of the peer's draft report.
- Critically evaluate the work of peer's and provide constructive feedback.
- To use skill and sensitivity in providing formative (constructive) feedback to peers.

The peer feedback of a draft report of a student will be provided to the student after the completion of the process i.e. by Week 12.

7.2.2 Submission – Final Report

The final report should be submitted in printed form after considering and incorporating the suggestions made in the peer review comments (if any). Reports submitted after the due date will incur a 10 % penalty of the available marks in that section, unless prior application for special consideration has been submitted and approved.

Final Report Assessment Criteria

The student will be assessed on their ability to understand and present the following:

- Abstract / Executive summary
- Table of contents provided
- Building type
- Building elements and their material and design principles
- Appropriateness of each of the building components in context of location of building, climatic condition, socio-cultural habit of building user, energy efficiency, sustainability of materials used.
- Improvement of building construction technology over the existing one.
- Presented in a concise, professional and well-structured manner.
- Integration of references to relevant literature.

7.2.3 Final Presentation

The student will present the major findings from his/her final report to the panel members (co-ordinator and invited reviewers). The ideas that have been identified have to be presented.

Format

The presentation should be addressed to the panel members. The student is welcome to present in his/her own format, but it has to be remembered that the format maximises the exposure to the content of the presentation.

Presentation : 15 minutes followed by Q&A : 5 minutes



Assessment Criteria

The presentation will be assessed by the panel members on the way of presentation and communication skills. The student will be assessed on his/her ability to address the assignment.

Presentation date: Week 14.

Students are required to be available for the entire week. The time of presentation will be advised at a later date.

7.3 Marking Scheme (It is to be revised as per Indian University/Affiliated university regulation)

Table 2 provides the detailed marking scheme in this subject.

Table 2: Summary of Assessment Tasks and Marking scheme

Assessment category	Brief Discussion	Weight (%)	Pass (%)	To pass, a student has to	
				obtain a minimum marks of	Out of
Class participation	Participation in weekly activities and active involvement in class discussion	10	4	8	20
Assignment 1 (Draft)	See Below	10	4	8	20
Assignment 2 (Peer Review)	Review of peer report (1000 words)	10	4	8	20
Assignment 3 (Final)	Professional report outlining as assessment of building construction methods and suggestions for improvement. (5000 words)	10	4	8	20



Assessment category	Brief Discussion	Weight (%)	Pass (%)	To pass, a student has to	
				obtain a minimum marks of	Out of
Final Presentation	Presentation of report findings and recommended improvements.	10	4	8	20
End semester exam	Theory based.	50	20	40	100
Total	--	100	40	80	200

The students will have to appear in an end semester examination (as per the guidelines of the University under which AEC is affiliated) which will be subjective in nature. A minimum mark of 40% (each assessment category) must be achieved in the examination in order to pass the subject. The assignments/presentations can be re-submitted in a semester if a student fails to score the requisite pass marks. However, if a student fails to achieve 40 % marks in the theory exam he will be deemed to fail in the subject and will have to clear in the next attempt.

8.0 REQUIRED READING

Students are expected to refer to various building construction and technology related topics from various sources, which might include case studies, conferences papers, library collections, eBooks and eJournals. A list of essential and optional reading is provided in Table – 3.

9.0 REQUIRED TEXT BOOKS

1. Chudley and Greeno, Building Construction Handbook, Eleventh Edition, Butterworth-Heinemann OR Eleventh Edition, Routledge.
2. George Wilkie, Building Your Own Home; (2011) New Holland Publishers.
3. National Building Code of India, BIS, 2005
4. Frederick S. Merritt; Jonathan T. Ricketts: Building Design and Construction Handbook, Sixth Edition.

REFERENCE BOOKS



1. Vargesse, P. C., Building Construction, Prentice Hall of India, New Delhi.
2. Jonathan T. Ricketts; M. Kent Loftin; Frederick S. Merritt: Standard Handbook for Civil Engineers. McGraw-Hill Professional.

10.0 ATTENDANCE POLICY

The attendance policy is as per the standard university guidelines (under which AEC is affiliated).

11.0 PLAGIARISM, COLLUSION AND CONSEQUENCES

Merriam-Webster's online dictionary explains that **Plagiarism** is the act of stealing and passing off (the ideas or words of another) as one's own; or using another's production without crediting the source; or to commit literary theft i.e. to present as new and original an idea or product derived from an existing source.

Collusion is the presentation by a student of an assignment as his or her own which is in fact the result in whole or part of unauthorised collaboration with another person or persons.

In any case where a student has been involved in plagiarism or collusion in an assessable assignment on task the marks awarded for that will be zero, and no substitution of an alternative task will normally be permitted.

12.0 Reading List

The reading list (as provided in Table 3) provides the literature that a student is expected to go through to understand the topics of the syllabus. However, this list is not an extensive one and may be updated and altered as and when necessary. Students are encouraged to come up with suggested literature in this field for discussion in or off the class.

Table 3: Reading List

Reading	Reference	Suggested Literature
BC-L1	Lecture 1	Text Book
BC-L2	Lecture 2	National Building Code of India (2005) (Part 3), Bureau of Indian Standards.



Reading	Reference	Suggested Literature
BC-L3.1	Lecture 3	Frederick S. Merritt; Jonathan T. Ricketts: Building Design and Construction Handbook, Sixth Edition. Chapter 3
BC-L3.2		National Building Code of India (2005) (Part 6, Section 1, Clause 9), Bureau of Indian Standards.
BC-L4-5.1	Lecture 4 Lecture 5	National Building Code of India (2005) (Part 6, Section 2), Bureau of Indian Standards.
BC-L4-5.2		Frederick S. Merritt; Jonathan T. Ricketts: Building Design and Construction Handbook, Sixth Edition. Chapter 6.
BC-L6-7	Lecture 6 Lecture 7	Frederick S. Merritt; Jonathan T. Ricketts: Building Design and Construction Handbook, Sixth Edition. Chapter 5.
BC-L8-9	Lecture 8 Lecture 9	National Building Code of India (2005) (Part 6, Section 4), Bureau of Indian Standards
BC-L10-11.1	Lecture 10 Lecture 11	Frederick S. Merritt; Jonathan T. Ricketts: Building Design and Construction Handbook, Sixth Edition. Chapter 9.
BC-L10-11.2		National Building Code of India (2005) (Part 6, Section 5A), Bureau of Indian Standards
BC-L12-13-14	Lecture 12 Lecture 13 Lecture 14	Frederick S. Merritt; Jonathan T. Ricketts: Building Design and Construction Handbook, Sixth Edition. Chapter 11.
BC-L15	Lecture 15	Frederick S. Merritt; Jonathan T. Ricketts: Building Design and Construction Handbook, Sixth Edition. Chapter 12.
BC-L16.1	Lecture 16	IS 1343: 1980 'Code of practice for prestressed Concrete
BC-L16.2		Miller, J. P., Fundamentals of post tensioned concrete design in Buildings (Part 3), A SunCam online continuing education course.
BC-L17-18.1	Lecture 17 Lecture 18	www.nptel.ac.in/courses/105106113/2_industrial_building/
BC-L17-18.2		S. D. Wankhade, P. S. Pajgade (2014) Design & Comparison of Various Types of Industrial Buildings, International Refereed Journal of Engineering and Science (IRJES), <i>Volume 3, Issue 6 (June 2014)</i> ,
BC-L17-18.3		J. M. Fisher, Industrial Buildings—Guidelines and Criteria.



Reading	Reference	Suggested Literature
BC-L19-20	Lecture 19 Lecture 20	National Building Code of India (2005) (Part 6, Section 7A and 7B), Bureau of Indian Standards
BC-L21-22.1	Lecture 21 Lecture 22	https://www.zamilsteel.co.in/products/pre-engineered-buildings/
BC-L21-22.2		Cold Formed Sections – Sections Properties.
BC-L21-22.3		Cold-Formed Steel in Building Construction, Cold-Formed Steel Profile (2010).
BC-L21-22.4		Cold Formed Steel Design.
BC-L21-22.5		IS 801-1975 Code of Practice for Use of Cold-Formed Light Gauge Steel Structural Members In General Building Construction
BC-L23-24.1	Lecture 23 Lecture 24	https://igbc.in/igbc/redirectHtml.htm?redVal=showGreenNewBuildingsnesign
BC-L23-24.2		http://www.grihaindia.org/index.php?option=com_content&view=article&id=73
BC-L25-26.1	Lecture 25 Lecture 26	National Building Code of India (2005) (Part 7, Section 1-4), Bureau of Indian Standards
BC-L25-26.2		G. R. Smith and R. D. Roth (1991), Safety Programs and the Construction Managers, J. of Construction Engg. And Management, ASCE, Vol.117(2), pp. 360-371.
BC-L25-26.3		J. Hinze and P. Raboud (1988) Safety on Large Building Construction Projects, J. of Construction Engg. And Management, ASCE, Vol.114(2), pp. 286-293.
BC-L27	Lecture 27	National Building Code of India (2005) (Part 7, Section 5), Bureau of Indian Standards
BC-L28	Lecture 28	National Building Code of India (2005) (Part 10, Section 1&2), Bureau of Indian Standards

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For any query please contact the subject coordinator over phone or email.

The study materials for the entire subject have been developed and will be available electronically.



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MASTER OF CONSTRUCTION MANAGEMENT
ASSAM ENGINEERING COLLEGE
GUWAHATI-781013

CONTRACT MANAGEMENT
(SUBJECT GUIDE)

(Version-1.0)
Prepared by – Dr. Jayanta Pathak



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1.0 INTRODUCTION

Contract management is the process of systematically and efficiently managing the contract life-cycle contract creation, execution and analysis for maximising operational and financial performance and minimising risk”.¹ There are a number of other definitions of contract management, the majority of which refer to post-award activities. Successful contract management, however, is most effective if upstream or pre-award activities are properly carried out. Organisations in both the public and private sectors are facing increasing pressure to reduce costs and improve financial and operational performance. New regulatory requirements, globalization, increases in contract volumes and complexity have resulted in an increasing recognition of the importance and benefits of effective contract management.

The growing recognition of the need to automate and improve contractual processes and satisfy increasing compliance and analytical needs has also led to an increase in the adoption of more formal and structured contract management procedures and an increase in the availability of software applications designed to address these needs.

There has been a significant shift in contracting strategy within the construction market in recent years, particularly regarding traditional risk allocation. In many countries enjoying favorable economic conditions, it is no longer unusual to see Contractors refusing to bid for the usual fixed price and time contracts. This change is partly driven by Contractors becoming more sophisticated in their risk analysis, but also largely due to:

- the current surge in demand in the global construction and engineering sectors
- the significant size, complexity and profile of so-called “mega projects”
- the shortage of Contractors with the experience and resources needed to deliver such mega projects
- the shortage of experienced labour and quality materials and resultant fluctuations in associated costs.

Increasingly, Owners and Contractors are looking for alternatives to the traditional fixed price and time project delivery methods. While the traditional delivery methods remain (such as design and build; Engineering, Procurement and Construction (EPC); and construct only), the risk allocation and payment arrangements vary significantly.



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2.0 OVERVIEW & OBJECTIVES OF THE SUBJECT:

This subject examines the principles and procedures for effective contract management from both clients' and contractors' perspectives. Practices and techniques of planning and managing a contract through to a successful conclusion are presented.

Topics include: development of legal framework for project delivery (contract formation – principles and philosophies of contract drafting); contract negotiation techniques and execution; contract performance, monitoring and enforcement; managing project close-out; relationship management during the construction phase; project procurement and allocation of risks; payment systems; contractual responsibilities and liabilities imposed by general conditions of contracts; construction delay claims management; conflict and dispute management.

The subject also examines allowancing and partnering contracts, performance-based contracts as well as contract management in the context of BIM-based projects.

Contract management software applications are used where applicable.

The student will have clear understanding of -



At the end of the subject, students are required to go through a self-assessment process that helps them identify knowledge gaps and own development paths as well as the importance of peer interaction and reflective learning in team environments. In undertaking this subject students will understand the basic principles of building regulations and will have exposure to various national buildings codes and building bye laws.

This subject aims to give students an introduction to construction regulations including:

3.0 LEARNING OUTCOME

On completion of this subject the student is expected to develop a thorough understanding of all key competency areas in Building Regulations

The core objectives:

Upon completion of this subject, students should be able to:

- Interpret, explain and compare the obligations and responsibilities imposed by selected general conditions of contracts used locally and internationally.
- Identify potential situations which may have legal consequences and negatively impact upon the project delivery outcomes.
- Analyse the complex and interrelated issues associated with contract management and identify when to seek professional advice on a project.
- Manage and control the contractual environment of projects.
- Identify, prepare, and analyse extension of time claims as well as explain the management and legal principles involved.
- Differentiate and explain various conflicts and dispute resolution processes.

4.0 GENERIC SKILLS

On successful completion of the subject students should have developed the following skills and capabilities:

At the completion of the subject students should have developed the following skills and capabilities:

1. Work effectively with other professionals on a project;
2. Team building;
3. Critical thinking and problem solving;
4. Adapt to and work effectively in different contract environments, both locally and internationally.



5.0 DETAILED SUBJECT SCHEDULE

Total contact period : 44 hours

Duration of Lecture : 1 Hour

Duration of tutorial : 3 hours

Table 1: Detailed subject schedule

Week	Lecture	Topic	Learning Activities
1	Lecture 1:	Subject introduction and requirements - What is Contract Management? - Introduction to Contract pre-award activities - Initiating Construction Stage	Reading list: CTM-1-1(Essential) CTM-1-1(Optional)
	Lecture 2:	Introduction to Contract Management Process - Introduction to Contract post-award activities - Traditional process : Design-Tender-Construction - Two Stage Tendering - EPC/BOT	Reading list: CTM-2-1(Essential)
	Tutorial 1	Introduction to Contract Management Process Management Documents – Project Implementation Plan (PEP) Project Management Plan (PMP)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 1 & 2.
2	Lecture 3:	Project Objective Purpose and Priorities - Critical Risk Analysis - Organisation Roles and Responsibilities	Reading list: CTM-3-1(Essential) CTM-3-1(Optional)
	Lecture 4:	Project Objective Purpose and Priorities	Reading list: CTM-4-1(Essential)



Week	Lecture	Topic	Learning Activities
		- Identify Design Deliverables Milestones - Procurement of Materials & Services Milestones - Construction phase logistics	CTM-4-1(Optional)
	Tutorial 2	Project Strategy -Site logistics, Constraints Phasing, Safety, Insurances, identify Project Documents - general Condition of Contract (GCC) and Special Condition of Contract (SCC), Working Drawings, Specification, BOQ	Discussions / quiz etc. based on the contents of Essential Readings of Lecture 3 & 4.
3	Lecture 5:	General Condition of Contract - Jurisdiction / applicability - Understanding Provisions for project control and variations - Guidelines for Safety, Insurance, Welfare - Legal issues, disposal of disputes - procedure, arbitration and fore-closure provisions	Reading list: CTM-5-6-7-1(Essential) CTM-5-6-7-1(Optional)
	Lecture 6:	Special Condition of Contract (SCC) - Why called Special ? - Understanding Project specific conditions - International projects requirement - Identifying long-lead items of procurement for Contract administration - Responsibilities and Duties of the Contract Manager	Reading list: CTM-5-6-7-1(Essential) CTM-5-6-7-1(Optional)
	Tutorial 3	Worked Examples and Reflections – Case study of a construction project , Time-Cost-Quality Triangle , PEP, PMP (Lecture 5 & 6)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 5 & 6.
4	Lecture 7:	Pre-Start / Kick-off Meeting - Agenda for kick -off meeting - Sharing of project documents	Reading list: CTM-5-6-7-1(Essential)



Week	Lecture	Topic	Learning Activities
		- Lines of formal project communication - Site set up and security arrangement	CTM-5-6-7-1(Optional)
	Lecture 8:	Contract Mobilization - Understanding the procedure - Requirement and compliances for mobilization for Client - Requirement and compliances for mobilization for Contractor	Reading list: CTM-8-1(Essential) CTM-8-1(Optional)
	Tutorial 4	Worked Examples and Reflections – Case study of a construction project and understanding the documentation requirement and process, Mobilization, (Lecture 7 & 8)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 7 & 8.
Assignment 1	Assignment 1	Contract Management–Draft report due	
5	Lecture 9:	Project Communication, Document Control and BIM - Standard model for Communication - discussion and presentation schedule - Security and access control - traceability of documents - Intelligent numbering - Standard template for reporting - Revision control	Reading list: CTM-9-10-11-1 (Essential) CTM-9-10-11-1 (Optional)
	Lecture 10:	Project Communication, Document Control and BIM - Contract documents with BIM protocol - Advantages of BIM protocol - Access to critical project information in BIM protocol - design, construction and operation phase	Reading list: CTM-9-10-11-1 (Essential) CTM-9-10-11-1 (Optional)
	Tutorial 5	Worked Examples and Reflections – Case study of a construction project and understanding communication protocol and	Discussions/quiz etc. based on the contents of Essential



Week	Lecture	Topic	Learning Activities
		document control, Advantage of using BIM (Lecture 9 & 10)	Readings of Lecture 9 & 10.
6	Lecture 11:	Risk Identification and Management • Risk versus issues • Risk assessment and Risk-impact matrix • Risk Response and Risk Impact rating matrix • Issue Log and Issue type • Issue management framework	Reading list: CTM-9-10-11-1 (Essential) CTM-9-10-11-1 (Optional)
	Lecture 12:	Risk Identification and Management • Dealing with Risk • Insurance Risk • Bonds and Guarantee Risk • Working towards reducing value of advance payment / performance bond	Reading list: CTM-12-13-1 (Essential) CTM-12-13-1 (Optional)
	Tutorial 6	Individual Presentation on Case study of a construction project and understanding 'Risk' and 'Issue' in a project and their management technique. Discussion on various insurances and bonds from lecture 11-12	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 11 & 12.
7	Lecture 13:	Managing Construction Stage Performance & Relationship • Supervising Contractor's Performance • Inception Report • Construction Project Control Loop - Plan-Perform-Correct-Control	Reading list: CTM-12-13-1 (Essential) CTM-12-13-1 (Optional)
	Lecture 14:	Managing Construction Stage Performance & Relationship • Construction Project Control Loop - Plan-Perform-Correct-	Reading list: CTM-14-1(Essential) CTM-14-1(Optional)



Week	Lecture	Topic	Learning Activities
		Control	
	Tutorial 7	Worked Examples and Reflections – Case study of a construction project and understanding Management of Construction Stage Performances and Relationship (Lecture 9 & 10)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 13 & 14.
8	Lecture 15:	Payment to the Contractor • Pricing Documents & Structure of Bill of Quantities • Schedule of rates and Measurements • Procedure for Interim Payments	Reading list: CTM-15-16-17-1 (Essential) CTM-15-16-17-1 (Optional)
	Lecture 16:	Payment to the Contractor • Payment for procurement of materials on site and off site • Activity schedule & Retention as per contract documents • Asset management & Taxation • Cost Monitoring	Reading list: CTM-15-16-17-1 (Essential) CTM-15-16-17-1 (Optional)
	Tutorial 8	Worked Examples and Reflections – Case study of a construction project , understanding Payment procedure to contractor, payment against material procurement: lecture (15, 16)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
Assignment 2	Assignment 2	Peer Review of draft report of Assignment 1 (peer review report due)	
9	Lecture 17:	Variations and Changes • Definition of Variations • Types of Variations • Cause of Variations • Controlling Variations	Reading list: CTM-15-16-17-1 (Essential) CTM-15-16-17-1 (Optional)
	Lecture 18:	Variations and Changes	Reading list:



Week	Lecture	Topic	Learning Activities
		- Variation control at Design Stage - Variation Control at Construction stage - Variation control at Design - overlap - Issuing variations and valuing Variations	CTM-18-19-20-1 (Essential) CTM-18-19-20-1 (Optional)
	Tutorial 9	Worked Examples and Reflections – Case study of a construction project	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
10	Lecture 19:	Subcontract in Project - Relationship between Main and Sub-Contractor - Relationship between Sub-contractor and Employer	Reading list: CTM-18-19-20-1 (Essential) CTM-18-19-20-1 (Optional)
	Lecture 20:	Subcontract in Project - Collateral warranties & Right of third parties - Subcontract vs. Assignment	Reading list: Reading list: CTM-18-19-20-1 (Essential) CTM-18-19-20-1 (Optional)
	Tutorial 10	Worked Examples and Reflections – Case study of a construction project- back-to-back clause in a sub-contract, 'set-off' in terms of sub-contract, function of collateral warranties	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
11	Lecture21:	Value Management and Cost Reduction - Value Management process - Time-Cost-Quality Triangle mapping on project	Reading list: CTM-21-22-1(Essential) CTM-21-22-1(Optional)
	Lecture22:	Value Management and Cost Reduction	Reading list: CTM-21-22-



Week	Lecture	Topic	Learning Activities
		- Value Engineering - Value System Matrix for a construction project	1(Essential) CTM-21-22-1(Optional)
	Tutorial 11	Worked Examples and Reflections – Case study of a construction project and understanding FAST diagram, Value system matrix and benefit of 'ACID TEST'	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
12	Lecture 23:	Finalising the Construction Stage - Completion and Close out - Early Termination of Contract and Suspension of Work - Termination by Employer - Suspension by employer - Termination and Suspension by Contractor	Reading list: CTM-23-24-1(Essential) CTM-23-24-1(Optional)
	Lecture 24:	Completion, Delays and Damages - Completion under standard form of Contract - Practical / Substantial Completion - Delays and Extension of Time - Main cause of Delay in Project - Damage and Penalties for Non-completion	Reading list: CTM-23-24-1(Essential) CTM-23-24-1(Optional)
	Tutorial 12	Worked Examples and Reflections – Case study of a construction project and understanding and analyzing cause of delays, Importance of Time in Contract, Working definition of Substantial completion (lecture 23, 24)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
13	Lecture 25:	Defect Liability, Correction , Completion and Close-out - What constitute Defect ? - Deficiency due to Design,	Reading list: CTM-25-1(Essential) CTM-25-1(Optional)



Week	Lecture	Topic	Learning Activities
		Construction, Materials, geotechnical • Patent and Latent Defects •	
	Lecture 26:	Defect Liability, Correction , Completion and Close-out • Snagging List and Punch List • testing And Commissioning • Final Completion Contract Close-out	Reading list: CTM-26-27-28-1(Essential) CTM-26-27-28-1 (Optional)
	Tutorial 13	Worked Examples and Reflections – Case study of a construction project and understanding and analyzing cause defects, List out Patent and Latent defects, Purpose and time of snagging list, Close-out report (lecture 23, 24)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
14	Lecture 27:	Claims and Disputes • Legal Basis covering Contractual claims • breach of Contract	Reading list: CTM-26-27-28-1(Essential) CTM-26-27-28-1 (Optional)
	Lecture 28:	Claims and Disputes • Components of claim documents • Importance of records in Contract	Reading list: CTM-26-27-28-1(Essential) CTM-26-27-28-1 (Optional)
	Tutorial 14	Worked Examples and Reflections – Case study of a construction project and understanding 'quantum merit', evidence required in claim documents, keeping records	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
15	Lecture 29:	Adjudication , Arbitration and	Reading list:



Week	Lecture	Topic	Learning Activities
		Litigation • Adjudication process • Advantage and disadvantage of adjudication	CTM-29-1(Essential) CTM-29-1(Optional)
	Lecture 30:	Adjudication , Arbitration and Litigation • Arbitration process • Advantage and disadvantage of Arbitration process • Comparison with Adjudication • Litigation and pre-action protocol • Ethics and Fair dealings • Act of Integrity	Reading list: CTM-30-1(Essential) CTM-30-1(Optional)
	Tutorial 15	brief discussion and example case study on Adjudication, Arbitration, Litigation. Understanding Ethical standards, and Integrity in Contracts (lecture 29, 30)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
16	Assignment 3	Contract Management – Final Report due.	
	Group Discussions	Date and Topics TBA later	
	Final Presentations	Date and Topics TBA later	

6.0 PEDAGOGICAL APPROACH, ACTIVITIES

The pedagogical approach is based on classroom lectures of up to 1 hour duration twice a week during the course. The lectures will involve a range of teaching topics, which will include introduction and discussion of Building provisions and compliances. The teaching modes apart from classroom lectures will include tutorials on case study of various applications of Building Regulation, various group activities such as, group assignments, site visits, preparation of case studies, and guest presentations from professionals working on live projects to provide both specialist knowledge and the problems faced during management of projects in the real world. Seminars will be held every week so that each student can share their knowledge, ask questions and dive further in to the subject materials. The timings of the



scheduled activities will be provided at the beginning of the course, depending on the annual academic calendar of the college.

7.0 ASSESSMENT

Assessment in this subject has both formative and summative aspects to it. The students will have an opportunity to provide formative feedback to their peers and receive constructive feedback in return, as well as from the subject coordinator. This will give them the opportunity to develop and improve on particular skills throughout the course of the subject.

There are five assessment tasks in this subject. The assessment tasks (class participation, assignment 1 to 3 and final presentation) mimic the activities that a student is most likely to undertake in a real situation. This task will be used to demonstrate that the student have developed the skills needed to assess complex Building Regulation related topics and possible solutions to improving their performance and communicate their findings in a professional context.

The students' main tasks will be to develop a project taking all the components like tendering, scheduling, resource mapping etc. and present it as a professional project report and an oral presentation. A summary of the marking scheme is provided in Table 2. Specific requirements for each task are provided in section 7.1 and 7.2.

7.1 Class Participation

The subject involves a range of activities and participation of the student is critical for achieving the learning outcome of the subject.

The assessment for this task will involve a number of in-class discussion, quizzes relating to content and preparation of software based project.

The students will be assessed on their ability to

- Understand and interpret the different components of Building Regulation discussed during seminars
- Respond appropriately to questions

7.2 Assignment (Example only – to develop for Indian Context)

Report format

The report should be presented in A4 format with margins of 2.50m in each side and the pages numbered. The line spacing should be 1.50 cm. Both sides of the page should be utilized for printing.



Heading, tables, diagrams are to be used and appropriately numbered. An abstract or executive summary at the beginning of the report is to be included (which will include key findings and recommendations). A 100 word summary by each member reflecting on the individual contributions, overall understanding and development of planning and programming skills in the assignments.

There is no page limit as such for the report, but it should be approximately 5000 words in length (excluding tables, diagrams and references)

Use of references to existing research/literature in order to support the argument of the report is to be included and properly referenced. The Harvard referencing format (i.e. Author (year)) should be used to cite specific references and all the references should be referred to in a 'References' section at the end of the report. The students must use consistent and professional formatting styles. They need to have table of contents showing only the first two levels of headings. The appearance of the report must be professional, clean, and consistent from start to end.

The students are advised to refer to online skill development courses provided by www.coursera.org to get a better idea of how to put their ideas to words. The following links may be useful for the students

<https://www.coursera.org/learn/business-writing>

<https://www.coursera.org/specializations/academic-english>

Submission – Draft Report

The students are required to submit a draft of their report in week 4. The draft report should, as a minimum be structured and formatted as it is planned to present the final report. As a minimum the student should include a table of contents, type of project selected, identification of client, short description of the project, relevant information about the organisation's recent history, mission and goals, circumstances and problems leading to the currently proposed project work already carried out in the area of the proposed project and stakeholders in the projects.

The Draft Report should not provide any identifying details (name, enrolment number etc) that could be used to identify the student, as the peer review process will be anonymous.

Submit your draft report in print form with proper spiral bind.

7.2.1 Peer Review

Students are required to critically review one of their colleagues' Building Regulation Draft Reports and provide constructive feedback on how they might be improved. The review should be approximately between 500-1000 words. Primary focus should



be on the strengths and weakness of the peer's draft report and how well they address the requirement of for developing a project.

The peer review should focus on making suggestions to help the peer further develop and improve their report.

Peer review assessment criteria

The student will be assessed in his ability to:

- Demonstrate an understanding of the broad principles of Building Regulation
- Apply that understanding to the analysis and critique of the peer's draft report.
- Critically evaluate the work of peer's and provide constructive feedback.
- To use skill and sensitivity in providing formative (constructive) feedback to peers.

The peer feedback of a draft report of a student will be provided to the student after the completion of the process i.e. by Week 8.

7.2.2 Submission-final report

The final report should be submitted in printed form after considering and incorporating the suggestions made in the peer review comments (if any).

Reports submitted after the due date will incur a 10 % penalty of the available marks in that section, unless prior application for special consideration has been submitted and approved.

Final Report Assessment Criteria (to develop) Example only

7.2.3 Final Presentation

The student will present the major findings from his/her final report to the panel members (coordinator and invited reviewers). The ideas that have been identified have to be presented.

Format

The presentation should be addressed to the panel members, as a project proposal for implementation. The student is welcome to present in an own format, but it has to be remembered that the format maximizes the exposure to the content of the presentation.

Presentation : 15 minutes followed by Q&A : 5 minutes



Assessment Criteria

The presentation will be assessed by the panel members on the way of presentation and communication skills and how well a student is able to convince the panel members and taking care of the different components of the designed project.

Presentation date: Week 10.

Students are required to be available for the entire week. The time of presentation will be advised at a later date.

7.3 Marking Scheme – to be as per University Regulation followed by AEC

Table 2 provides the detailed marking scheme in this subject.

Table 2: Summary of Assessment Tasks and Marking scheme

Assessment category	brief Discussion	Weight (%)	Pass (%)	To pass, a student has to	
				obtain a minimum marks of	Out of
Class participation	Participation in weekly activities and active involvement in class discussion	10	4	8	20
Assignment 1 (Building Regulation-Draft)	See Below	10	4	8	20
Assignment 2 (Peer Review)	Review of peer report (1000 words)	10	4	8	20
Assignment 3 (Building Regulation Final)	Professional report outlining as assessment of Building Regulation and suggestions for improvement (5000 words)	10	4	8	20

Assessment category	brief Discussion	Weight (%)	Pass (%)	To pass, a student has to	
				obtain a minimum marks of	Out of
Final Presentation	Presentation of report findings and recommended improvements	10	4	8	20
End semester exam	Theory based	50	20	40	100
Total	--	100	40	80	200

The students will have to appear in an end semester examination (as per the guidelines of the University under which AEC is affiliated) which will be subjective in nature. A minimum mark of 40% (each assessment category) must be achieved in the examination in order to pass the subject. The assignments/ presentations can be re-submitted in a semester if a student fails to score the requisite pass marks. However, if a student fails to achieve 40 % marks in the theory exam he will be deemed to fail in the subject and will have to clear in the next attempt.

8.0 REQUIRED READING

Students are expected to refer to various building operations and services related topics from various sources, which might include case studies, conferences papers, library collections, eBooks and eJournals. A list of essential and optional reading is provided in Table – 3, Section 13.

9.0 REQUIRED TEXTS

[illegible]

10.0 ATTENDANCE POLICY

The attendance policy is as per the standard university guidelines (under which AEC is affiliated).

11.0 PLAGIARISM, COLLUSION AND CONSEQUENCES

Merriam-Webster's online dictionary explains that **Plagiarism** is the act of stealing and passing off (the ideas or words of another) as one's own; or using another's



production without crediting the source; or to commit literary theft i.e. to present as new and original an idea or product derived from an existing source.

Collusion is the presentation by a student of an assignment as his or her own which is in fact the result in whole or part of unauthorised collaboration with another person or persons.

In any case where a student has been involved in plagiarism or collusion in an assessable assignment on task the marks awarded for that will be zero, and no substitution of an alternative task will normally be permitted.

12.0 READING LIST

The reading list (as provided in Table 3) provides the literature that a student is expected to go through to understand the various state of practice in the field of Fundamentals of Project Managements. The literature marked 'ESSENSTIAL' consists of a published literature which is a must read for the students. However this list is not an extensive one and may be updated and altered as and when necessary. Students are encouraged to come up with suggested literature in this field for discussion in or off the class.

Table 3: Reading List: Building Regulation

Reading	Topic	Reference	Suggested Literature
CTM-1-1	Subject introduction and requirements • What is Contract Management? • Introduction to Contract pre-award activities • Initiating Construction Stage	Lecture 1	
CTM-2-1	Introduction to Contract Management Process • Introduction to Contract post-award activities • Traditional process :	Lecture 2	



Reading	Topic	Reference	Suggested Literature
	Design-Tender-Construction Two Stage Tendering - EPC/BOT		
CTM-3-1	Project Objective Purpose and Priorities - Critical Risk Analysis - Organisation Roles and Responsibilities	Lecture 3	
CTM-4-1	Project Objective Purpose and Priorities - Identify Design Deliverables Milestones - Procurement of Materials & Services Milestones - Construction phase logistics	Lecture 4	
CTM-5-6-7-1	General Condition of Contract - Jurisdiction / applicability - Understanding Provisions for project control and variations - Guidelines for Safety, Insurance, Welfare - Legal issues, disposal of disputes - procedure, arbitration and fore-closure provisions	Lecture 5	
CTM-5-6-7-1	Special Condition of Contract (SCC) - Why called Special ? - Understanding Project specific conditions - International projects requirement - Identifying long-lead items of procurement for Contract administration	Lecture 6	



Reading	Topic	Reference	Suggested Literature
	Responsibilities and Duties of the Contract Manager		
CTM-5-6-7-1	Pre-Start / Kick-off Meeting - Agenda for kick-off meeting - Sharing of project documents - Lines of formal project communication - Site set up and security arrangement	Lecture 7	
CTM-8-1	Contract Mobilization - Understanding the procedure - Requirement and compliances for mobilization for Client - Requirement and compliances for mobilization for Contractor	Lecture 8	
CTM-9-10-11-1	Project Communication, Document Control and BIM - Standard model for Communication - discussion and presentation schedule - Security and access control - traceability of documents - Intelligent numbering - Standard template for reporting - Revision control	Lecture 9	
CTM-9-10-11-1	Project Communication, Document Control and BIM	Lecture 10	



Reading	Topic	Reference	Suggested Literature
	- Contract documents with BIM protocol - Advantages of BIM protocol - Access to critical project information in BIM protocol - design, construction and operation phase		
CTM-9-10-11-1	Risk Identification and Management - Risk versus issues - Risk assessment and Risk-impact matrix - Risk Response and Risk Impact rating matrix - Issue Log and Issue type - Issue management framework	Lecture 11	
CTM-12-13-1	Risk Identification and Management - Dealing with Risk - Insurance Risk - Bonds and Guarantee Risk - Working towards reducing value of advance payment / performance bond	Lecture 12	
CTM-12-13-1	Managing Construction Stage Performance & Relationship - Supervising Contractor's Performance - Inception Report - Construction Project Control Loop - Plan-Perform-Correct-Control	Lecture 13	
CTM-14-1	Managing Construction Stage	Lecture 14	



Reading	Topic	Reference	Suggested Literature
	Performance & Relationship Construction Project Control Loop - Plan-Perform-Correct-Control		
CTM-15-16-17-1	Payment to the Contractor - Pricing Documents & Structure of Bill of Quantities - Schedule of rates and Measurements - Procedure for Interim Payments	Lecture 15	
CTM-15-16-17-1	Payment to the Contractor - Payment for procurement of materials on site and off site - Activity schedule & Retention as per contract documents - Asset management & Taxation - Cost Monitoring	Lecture 16	
CTM-15-16-17-1	Variations and Changes - Definition of Variations - Types of Variations - Cause of Variations - Controlling Variations	Lecture 17	
CTM-18-19-20-1	Variations and Changes - Variation control at Design Stage - Variation Control at Construction stage - Variation control at Design -overlap	Lecture 18	



Reading	Topic	Reference	Suggested Literature
	Issuing variations and valuing Variations		
CTM-18-19-20-1	Subcontract in Project - Relationship between Main and Sub-Contractor - Relationship between Sub-contractor and Employer	Lecture 19	
CTM-18-19-20-1	Subcontract in Project - Collateral warranties & Right of third parties - Subcontract vs. Assignment	Lecture 20	
CTM-21-22-1	Value Management and Cost Reduction - Value Management process - Time-Cost-Quality Triangle mapping on project	Lecture 21	
CTM-21-22-1	Value Management and Cost Reduction - Value Engineering - Value System Matrix for a construction project	Lecture 22	
CTM-23-24-1	Finalising the Construction Stage - Completion and Close out - Early Termination of Contract and Suspension of Work - Termination by Employer - Suspension by employer - Termination and Suspension by	Lecture 23	



Reading	Topic	Reference	Suggested Literature
	Contractor		
CTM-23-24-1	Completion, Delays and Damages • Completion under standard form of Contract • Practical / Substantial Completion • Delays and Extension of Time • Main cause of Delay in Project • Damage and Penalties for Non-completion	Lecture 24	
CTM-25-1	Defect Liability, Correction , Completion and Close-out • What constitute Defect ? • Deficiency due to Design, Construction, Materials, geotechnical • Patent and Latent Defects	Lecture 25	
CTM-26-27-28-1	Defect Liability, Correction , Completion and Close-out • Snagging List and Punch List • testing And Commissioning • Final Completion Contract Close-out	Lecture 26	
CTM-26-27-28-1	Claims and Disputes • Legal Basis covering Contractual claims • breach of Contract	Lecture 27	



Reading	Topic	Reference	Suggested Literature
CTM-26-27-28-1	Claims and Disputes • Components of claim documents • Importance of records in Contract	Lecture 28	
CTM-29-1	Adjudication , Arbitration and Litigation • Adjudication process • Advantage and disadvantage of adjudication	Lecture 29	
CTM-30-1	Adjudication , Arbitration and Litigation • Arbitration process • Advantage and disadvantage of Arbitration process • Comparison with Adjudication • Litigation and pre-action protocol • Ethics and Fair dealings • Act of Integrity	Lecture 30	

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Smart Villages Lab
Culture • Construction • Capacity • Community



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For any query please don't hesitate to contact me over phone or email.

The study materials for the entire subject have been developed and will be available electronically.



MASTER OF CONSTRUCTION MANAGEMENT
ASSAM ENGINEERING COLLEGE
GUWAHATI-781013

3R IN CONSTRUCTION
(REPAIR REHABILITATION AND RETROFITTING)
(SUBJECT GUIDE)

(Version-1.0)
Prepared by
Dr. Jayanta Pathak & Dr. Bipul Talukdar



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INTRODUCTION

Reinforced cement concrete (RCC) is the most widely used construction material for the last one century. RCC has been used extensively in India in the last 50-60 years. Many infrastructural assets in terms of buildings, bridges, sports stadium etc., are created, which are lifeline for the nation. It is very much essential to maintain infrastructure in functional condition. Since, deterioration of RCC is a natural phenomenon which reduces the life of costly infrastructure, a systematic approach is needed in dealing with such problems. Identification of the causes of deterioration and consequent repair/rehabilitation strategy at optimum cost needs a scientific approach of evaluation and maintenance or strengthening. The factors considered necessary for durability of RCC buildings are many times not given due importance during construction and/or during maintenance. The durability provisions have been given emphasis in the revised 'Code of Practice on Plain and Reinforced Concrete' (IS:456-2000) as well as in many international codes of practice.

There have been notable advancements in the field of protection, repairs, rehabilitation, strengthening and retrofitting of the existing RCC structures taking advantage of the advancement in the materials science, more particularly the polymer science. The knowledge in this area needs development and systematic dissemination.

OVERVIEW & OBJECTIVES OF THE SUBJECT:

The course has been largely developed based on the Handbook of Repair, published by CPWD and the handbook is listed as the essential reading materials for this course.

The course covers the subject starting from causes of deterioration, investigative methods, design principles, selection criteria of repair materials & methods, guidelines for selection of consultant, short-listing of contractors and preparation of contract documents for repair/ rehabilitation contracts including nomenclature and related specifications of commonly used repair items. A variety of case studies with as example of good-practice is included help the participants to have clear understanding of the subject. Initially, the structures deteriorate slowly due to cyclic temperature variations, overloading, physical causes & aggressive chemical attack due to environment etc. Later, if not paid due attention, these deteriorate rapidly and fail to meet the functional requirement for its designed service life. Various causes of deterioration like original construction defects, chloride induced corrosion, carbonation of concrete, sulphate attack, cracking due to thermal gradient, plastic shrinkage cracks and foundation settlement etc. are included. The first step in repairs and rehabilitation is the proper diagnosis for successful rehabilitation works. The course deals with Non-Destructive Evaluation (NDE) techniques, laboratory tests and Condition Survey Techniques. Symbols for recording distresses on building plans and worksheets have been given. Proforma for scientific analysis, planning and documentation has been developed which will go a long way in grouping / classification of damages. These in turn are useful tools in selection of the appropriate



repair technique. The course also gives brief outlines of the analysis and design of repairs, which are quite different from the original design.

The compatibility of repair material with the parent material is an essential requisite for successful repairs. It is important to provide guidance the engineers / architects to select the right type of material for a specific job. The directory of Indian manufacturers of repair materials and testing laboratories has been included for information of users as given in the Handbook (CPWD). The course also gives guidelines for selection of method from various repair options available to suit the performance requirement of repair system. As the structural repairs, must be generally investigated by the consultants and executed through contractors, a special form of contract documents is necessity.

The student will have clear understanding of -

1. Cause of distress and factor affecting durability of structures
2. Condition Survey and Non-Destructive Testing Procedure for assessment of distress
3. Repair and strengthening options available
4. Repair and strengthening materials available
5. Various specifications and procedure for 3R
6. Guidelines for outlining contract for 3R work – both consultancy and construction work
7. Various standard proforma and checklist for smart contract management of 3R work

At the end of the subject, students are required to go through a self-assessment process that helps them identify knowledge gaps and own development paths as well as the importance of peer interaction and reflective learning in team environments. In undertaking this subject student will understand the basic principles of building regulations and will have exposure to various national buildings codes and building bye laws.

This subject aims to give students an introduction to construction regulations including:

- **LEARNING OUTCOME**

On completion of this subject the student is expected to develop a thorough understanding of all key competency areas in Repair, Rehabilitation and Retrofitting (3R) in Construction.

The core objectives:

Upon completion of this subject, students should be able to:

- Make assessment of distress and damage in existing structure
- Identify critical scenario, which may render the structure unsafe or unserviceable



- Analyse the complex and interrelated issues and analyse various options for 3R.
- Understand various process and specifications of 3R
- Manage and control the contractual environment of 3R works

GENERIC SKILLS

On successful completion of the subject students should have developed the following skills and capabilities:

At the completion of the subject students should have developed the following skills and capabilities:

- Work effectively with other professionals on a 3R project;
- Critical thinking and problem solving;
- Understand the advantages and disadvantages of various options and materials for 3R project
- Adapt to and work effectively in very specific contract environments

DETAILED SUBJECT SCHEDULE

Total contact period : 45 hours

Duration of Lecture : 1 Hour

Duration of tutorial : 1 hours

Table 1: Detailed subject schedule

Week	Lecture	Topic	Learning Activities
1	Lecture 1:	Subject introduction and requirements • An overview of Current Repair/Rehab/Retrofitting practices • Introduction to Distress Identifications • Repair Management	Reading list: HANDBOOK - CPWD1(Essential) RRR-1 (Optional)
	Lecture 2:	Causes of Deterioration and Durability aspects • Holistic Model of Deterioration • Permeability of Concrete & Micro-cracks • Extrinsic and Intrinsic Causes of Distress	Reading list: HANDBOOK - CPWD1(Essential) RRR-1 (Optional)



	Tutorial 1	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 1 & 2)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 1 & 2.
2	Lecture 3:	Introduction to Condition Survey • Definition • Objective • Stages • Elaborate on various stages of evaluation	Reading list: HANDBOOK - CPWD1(Essential) RRR-2 (Optional)
	Lecture 4:	Condition Survey and Non-Destructive Evaluation • Preliminary Evaluation • Planning Stage • Visual Inspection • Field and Laboratory Testing stage	Reading list: HANDBOOK - CPWD1(Essential) RRR-2 (Optional)
	Tutorial 2	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 3 & 4)	Discussions / quiz etc. based on the contents of Essential Readings of Lecture 3 & 4.
3	Lecture 5:	Non-Destructive Evaluation • Consideration for Repair strategy • Non-Destructive Test	Reading list: HANDBOOK - CPWD1(Essential) RRR-2 RRR-8 (Optional)
	Lecture 6:	• Concrete Strength Assessment • Rebound Hammer Test • Ultrasonic Pulse Velocity Test	Reading list: HANDBOOK - CPWD1(Essential) RRR-2 RRR-8 (Optional)



	Tutorial 3	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 5 & 6)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 5 & 6.
4	Lecture 7:	Non-Destructive Evaluation • Penetration Resistance Test • Pull-out (LOK) Test • Core Sampling	Reading list: HANDBOOK - CPWD1(Essential) RRR-2 RRR-8 (Optional)
	Lecture 8:	Non-Destructive Evaluation • Discussion and Interpretation of Results of NDT • Is it conclusive or Indicative?	Reading list: HANDBOOK - CPWD1(Essential) RRR-2 RRR-8 (Optional)
	Tutorial 4	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 7 & 8)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 7 & 8.
4	Assignment 1	RRR–Draft report due	
5	Lecture 9:	Non-Destructive Evaluation • Chemical Test • Carbonation Test • Chloride Content •	Reading list: HANDBOOK - CPWD1(Essential) RRR-2 RRR-8 (Optional)
	Lecture 10:	Non-Destructive Evaluation • Corrosion Potential assessment • Resistivity Measurement	Reading list: HANDBOOK - CPWD1(Essential) RRR-2 RRR-8 (Optional)



			)
	Tutorial 5	Worked Examples and Reflections – Case study of a construction project and understanding (Lecture 9 & 10)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 9 & 10.
6	Lecture 11:	Non-Destructive Evaluation • Fire Damage Assessment • Differential Thermal Analysis • X-ray Diffraction	Reading list: HANDBOOK - CPWD1(Essential) RRR-2 RRR-8 (Optional)
	Lecture 12:	Structural Integrity and Soundness Assessment • Radiography • Impact-Echo Test • Dynamic Testing of Structure	Reading list: HANDBOOK - CPWD1(Essential) RRR-3 (Optional)
	Tutorial 6	Individual Presentation on Case study of a Worked Examples and Reflections – Case study of a construction project with RRR and understanding (Lecture 11 & 12)	Reading list: HANDBOOK - CPWD1(Essential) RRR-3 (Optional)
7	Lecture 13:	Interpretation and Evaluation of Test Results • Discussion on results of test and cause of deterioration	Reading list: HANDBOOK - CPWD1(Essential) RRR-2 (Optional) RRR-3 (Optional)
	Lecture 14:	Interpretation and Evaluation of Test Results	Reading list: HANDBOOK - CPWD1(Essential)



		Resultant Scenario development based on Condition Survey and test data	RRR-2 (Optional) RRR-3 (Optional)
	Tutorial 7	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 13 & 14)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 13 & 14.
8	Lecture 15:	Rehabilitation and Retrofitting Methods - Repair stages in details - Repair methods - Repair using Mortars, Epoxy, PAC, Shotcrete - Polymers, Plate bonding	Reading list: Reading list: HANDBOOK - CPWD1(Essential) RRR-2 (Optional) RRR-3 (Optional)
	Lecture 16:	Rehabilitation and Retrofitting Methods - RCC Jacketing - Props and Supports - Fibre Wrap Technique - Foundation Rehabilitation	Reading list: HANDBOOK - CPWD1(Essential) RRR-4 (Optional) RRR-6 (Optional) RRR-7(Optional)
	Tutorial 8	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 15 & 16)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
8	Assignment 2	Peer Review of draft report of Assignment 1 (peer review report due)	
9	Lecture 17:	RRR Strategies - Reduction of Stresses - Repair/Retrofitting of Beams/ Columns/ Slabs	Reading list: HANDBOOK - CPWD1(Essential) RRR-4 (Optional) RRR-6 (Optional) RRR-7(Optional)



	Lecture 18:	RRR Strategies • Repair of Cracks and Joints • Masonry • Protection • Base Isolations	Reading list: HANDBOOK - CPWD1(Essential) RRR-4 (Optional) RRR-6 (Optional) RRR-7(Optional)
	Tutorial 9	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 17 & 18)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
10	Lecture 19:	Guidelines for Forming and Managing RRR Contracts • Estimating quantum of RRR Job • Engagement of Consultant • Engagement of Contractor •	Reading list: HANDBOOK - CPWD1(Essential) RRR-5 (Optional)
	Lecture 20:	Guidelines for Forming and Managing RRR Contracts • Execution of Work • Post Repair Inspection • Performance Guarantee	Reading list: HANDBOOK - CPWD1(Essential) RRR-5 (Optional)
	Tutorial 10	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 19 & 20)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
11	Lecture21:	Schedule of Special Items for RRR works	Reading list: HANDBOOK - CPWD1(Essential)



		- Form work and Props - Special water tight cantering and shuttering - Providing and Fixing temporary protective barricades	RRR-5 (Optional)
	Lecture22:	Schedule of Special Items for RRR works - Procedure for removing Concrete and mortar - Dismantling existing RC work - Cutting of Reinforcement bars - Introducing new Reinforcement bars	Reading list: HANDBOOK - CPWD1(Essential) RRR-5 (Optional)
	Tutorial 11	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 21 & 22)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
12	Lecture 23:	Schedule of Special Items for RRR works - Grouting processes - Curing processes	Reading list: HANDBOOK - CPWD1(Essential) RRR-5 (Optional)
	Lecture 24:	Schedule of Special Items for RRR works - Post Repair Inspection - Various inspection methods	Reading list: HANDBOOK - CPWD1(Essential) RRR-5 (Optional)
	Tutorial 12	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 23 & 24)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.



13	Lecture 25:	Specifications for Structural Repair Work • Quality Assurance • Product deliver, Storage and Handling • Environment Requirement • Engagement of Personnel	Reading list: HANDBOOK - CPWD1(Essential) RRR-5 (Optional) RRR-6 (Optional) RRR-7(Optional)
	Lecture 26:	Specifications for Structural Repair Work • Safety of RRR work • Tools & plants • Field testing laboratory • Supervision • Internal Supervision • External Supervision	Reading list: HANDBOOK - CPWD1(Essential) RRR-5 (Optional) RRR-6 (Optional) RRR-7(Optional)
	Tutorial 13	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 15 & 16)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
14	Lecture 27:	Site Requirement for RRR work • Propping and Supporting • Watertight shuttering • Steel Tubular Scaffolding Barricades & Protection	Reading list: HANDBOOK - CPWD1(Essential) RRR-5 (Optional) RRR-6 (Optional) RRR-7(Optional)
	Lecture 28:	Site Requirement for RRR work • Surface Preparation	Reading list: HANDBOOK - CPWD1(Essential) RRR-5 (Optional) RRR-6 (Optional) RRR-7(Optional)



		• Removal, Cleaning of concrete / Mortar cover • Cutting and Repayment of Steel Reinforcements	
	Tutorial 14	Worked Examples and Reflections – Case study of a RRR project and understanding (Lecture 27 & 28)	Discussions/quiz etc. based on the contents of Essential Readings of Lecture 15 & 16.
15	Lecture 29:	Crack & Honeycomb Repair • Curing • Waterproofing and protective coating • Repair Process for Cracks in Masonry • Testing of Materials and Pre/ Post Repair of Structures	Reading list: HANDBOOK - CPWD1(Essential) RRR-5 (Optional) RRR-6 (Optional) RRR-7(Optional)
	Lecture 30:	Crack & Honeycomb Repair • Sealing by grouting - specifications • Provision of bonding coat • Micro concrete • Shotcrete • Polymer & Epoxy	Reading list: HANDBOOK - CPWD1(Essential) RRR-5 (Optional) RRR-6 (Optional) RRR-7(Optional)
	Tutorial 15	RRR Work Case study • Case study and discussion on RRR works • RRR work on Residential Multi-storeyed buildings	Reading list: HANDBOOK - CPWD1(Essential)



		• RRR works on Non-Residential Multi-storeyed buildings • RRR works on civil Infrastructure	
16	Assignment 3	3R in Construction – Final Report due.	
	Group Discussions	Date and Topics TBA later	
	Final Presentations	Date and Topics TBA later	

• PEDAGOGICAL APPROACH, ACTIVITIES

The pedagogical approach is based on classroom lectures of up to 1 hour duration twice a week during the course. The lectures will involve a range of teaching topics, which will include introduction and discussion of Building provisions and compliances. The teaching modes apart from classroom lectures will include tutorials on case study of various applications of 3R in Building, various group activities such as, group assignments, site visits, preparation of case studies, and guest presentations from professionals working on live projects to provide both specialist knowledge and the problems faced during management of projects in the real world. Seminars will be held every week so that each student can share their knowledge, ask questions and dive further in to the subject materials. The timings of the scheduled activities will be provided at the beginning of the course, depending on the annual academic calendar of the college.

• ASSESSMENT

Assessment in this subject has both formative and summative aspects to it. The students will have an opportunity to provide formative feedback to their peers and receive constructive feedback in return, as well as from the subject coordinator. This will give them the opportunity to develop and improve on skills throughout the course of the subject.

There are five assessment tasks in this subject. The assessment tasks (class participation, assignment 1 to 3 and final presentation) mimic the activities that a student is most likely to undertake in a real situation. This task will be used to demonstrate that the student has developed the skills needed to assess complex Repair, Rehabilitation and Retrofitting related topics and possible solutions to improving their performance and communicate their findings in a professional context.



The students' main tasks will be to develop a project taking all the components like tendering, scheduling, resource mapping etc. and present it as a professional project report and an oral presentation.

- **Class Participation**

The subject involves a range of activities and participation of the student is critical for achieving the learning outcome of the subject.

The assessment for this task will involve several in-class discussions, quizzes relating to content and preparation of software based project.

The students will be assessed on their ability to

- Understand and interpret the different components of Repair, Rehabilitation and Retrofitting discussed during seminars
- Respond appropriately to questions

- **Assignment (Example only – to develop for Indian Context)**

Report format

The report should be presented in A4 format with margins of 2.50m in each side and the pages numbered. The line spacing should be 1.50 cm. Both sides of the page should be utilized for printing.

Heading, tables, diagrams are to be used and appropriately numbered. An abstract or executive summary at the beginning of the report is to be included (which will include key findings and recommendations). A 100-word summary by each member reflecting on the individual contributions, overall understanding and development of planning and programming skills in the assignments.

There is no page limit as such for the report, but it should be approximately 5000 words in length (excluding tables, diagrams and references)

Use of references to existing research/literature to support the argument of the report is to be included and properly referenced. The Harvard referencing format (i.e. Author (year)) should be used to cite specific references and all the references should be referred to in a 'References' section at the end of the report. The students must use consistent and professional formatting styles. They need to have table of contents showing only the first two levels of headings. The appearance of the report must be professional, clean, and consistent from start to end.

The students are advised to refer to online skill development courses provided by www.coursera.org to get a better idea of how to put their ideas to words. The following links may be useful for the students

<https://www.coursera.org/learn/business-writing>



<https://www.coursera.org/specializations/academic-english>

Submission – Draft Report

The students are required to submit a draft of their report in week 4. The draft report should, as a minimum be structured and formatted as it is planned to present the final report. As a minimum the student should include a table of contents, type of project selected, identification of client, short description of the project, relevant information about the organisation's recent history, mission and goals, circumstances and problems leading to the currently proposed project work already carried out in the proposed project and stakeholders in the projects.

The Draft Report should not provide any identifying details (name, enrolment number etc) that could be used to identify the student, as the peer review process will be anonymous.

Submit your draft report in print form with proper spiral bind.

• Peer Review

Students are required to critically review one of their colleagues' 3R in Construction Draft Reports and provide constructive feedback on how they might be improved. The review should be approximately between 500-1000 words. Primary focus should be on the strengths and weakness of the peer's draft report and how well they address the requirement of developing a project.

The peer review should focus on making suggestions to help the peer further develop and improve their report.

Peer review assessment criteria

The student will be assessed in his ability to:

- Demonstrate an understanding of the broad principles of 3R in Construction
- Apply that understanding to the analysis and critique of the peer's draft report.
- Critically evaluate the work of peer's and provide constructive feedback.
- To use skill and sensitivity in providing formative (constructive) feedback to peers.

The peer feedback of a draft report of a student will be provided to the student after the completion of the process i.e. by Week 8.

• Submission-final report



The final report should be submitted in printed form after considering and incorporating the suggestions made in the peer review comments (if any).

Reports submitted after the due date will incur a 10 % penalty of the available marks in that section, unless prior application for special consideration has been submitted and approved.

Final Report Assessment Criteria (to develop) Example only

- Final Presentation**

The student will present the major findings from his/her final report to the panel members (coordinator and invited reviewers). The ideas that have been identified must be presented.

Format

The presentation should be addressed to the panel members, as a project proposal for implementation. The student is welcome to present in an own format, but it must be remembered that the format maximizes the exposure to the content of the presentation.

Presentation : 15 minutes followed by Q&A: 5 minutes

Assessment Criteria

The presentation will be assessed by the panel members on the way of presentation and communication skills and how well a student can convince the panel members and taking care of the different components of the designed project.

Presentation date: Week 16.

Students are required to be available for the entire week. The time of presentation will be advised later.

- Marking Scheme – to be as per University Regulation followed by AEC**

Table 2 provides the detailed marking scheme in this subject.

Table 2: Summary of Assessment Tasks and Marking scheme

Assessment category	Brief Discussion	Weight (%)	Pass (%)	To pass, a student must	
				obtain a minimum mark of	Out of



Class participation	Participation in weekly activities and active involvement in class discussion	10	4	8	20
Assignment 1 (Building Regulation-Draft)	See Below	10	4	8	20
Assignment 2 (Peer Review)	Review of peer report (1000 words)	10	4	8	20
Assignment 3 (Building Regulation Final)	Professional report outlining as assessment of Building Regulation and suggestions for improvement (5000 words)	10	4	8	20
Final Presentation	Presentation of report findings and recommended improvements	10	4	8	20
End semester exam	Theory based	50	20	40	100
Total	--	100	40	80	200

The students must appear in an end semester examination (as per the guidelines of the University under which AEC is affiliated) which will be subjective in nature. A minimum mark of 40% (each assessment category) must be achieved in the examination to pass the subject. The assignments/ presentations can be re-submitted in a semester if a student fails to score the requisite pass marks. However, if a student fails to achieve 40 % marks in the theory exam he will be deemed to fail in the subject and must clear in the next attempt.

• **REQUIRED READING**

Students are expected to refer to various Repair, Rehabilitation and Retrofitting related topics from various sources, which might include case studies, conferences papers, litany collections, eBooks and journals. A list of essential and optional reading is provided in Table – 3, Section 13.

• **REQUIRED TEXTS**



Handbook on Repair and Rehabilitation of RCC Buildings. CPWD, Govt. of India.

- **ATTENDANCE POLICY**

The attendance policy is as per the standard university guidelines (under which AEC is affiliated).

- **PLAGIARISM, COLLUSION AND CONSEQUENCES**

Merriam-Webster's online dictionary explains that **Plagiarism** is the act of stealing and passing off (the ideas or words of another) as one's own; or using another's production without crediting the source; or to commit literary theft i.e. to present as new and original an idea or product derived from an existing source.

Collusion is the presentation by a student of an assignment as his or her own which is in fact the result in whole or part of unauthorised collaboration with another person or persons.

In any case where a student has been involved in plagiarism or collusion in an assessable assignment on task the marks awarded for that will be zero, and no substitution of an alternative task will normally be permitted.

- **READING LIST**

The reading list (as provided in Table 3) provides the literature that a student is expected to go through to understand the various state of practice in the field of Fundamentals of Project Managements. The literature marked 'ESSENTIAL' consists of a published literature which is a must read for the students. However, this list is not an extensive one and may be updated and altered as and when necessary. Students are encouraged to come up with suggested literature in this field for discussion in or off the class.

Table 3: Reading List: 3R in Construction

Lecture	Topic	Suggested Literature
Lecture 1	Subject introduction and requirements	HANDBOOK -CPWD1(Essential) RRR-1 (Optional)
Lecture 2	Causes of Deterioration and Durability aspects	HANDBOOK -CPWD1(Essential) RRR-1 (Optional)
Lecture 3	Introduction to Condition Survey	HANDBOOK -CPWD1(Essential) RRR-2 (Optional)



Lecture 4	Condition Survey and Non-Destructive Evaluation	HANDBOOK -CPWD1(Essential) RRR-2 (Optional)
Lecture 5 Lecture 6 Lecture 7 Lecture 8 Lecture 9 Lecture 10 Lecture 11	Non-Destructive Evaluation	HANDBOOK -CPWD1(Essential) RRR-2 RRR-8 (Optional)
Lecture 12	Structural Integrity and Soundness Assessment	HANDBOOK -CPWD1(Essential) RRR-3 (Optional)
Lecture 13 Lecture 14	Interpretation and Evaluation of Test Results	HANDBOOK -CPWD1(Essential) RRR-2 (Optional) RRR-3 (Optional)
Lecture 15	Rehabilitation and Retrofitting Methods	HANDBOOK -CPWD1(Essential) RRR-2 (Optional) RRR-3 (Optional)
Lecture 16	Rehabilitation and Retrofitting Methods	HANDBOOK -CPWD1(Essential) RRR-4 (Optional) RRR-6 (Optional) RRR-7(Optional)
Lecture 17 Lecture 18	RRR Strategies	HANDBOOK -CPWD1(Essential) RRR-4 (Optional) RRR-6 (Optional) RRR-7(Optional)
Lecture 19 Lecture 20	Guidelines for Forming and Managing RRR Contracts	HANDBOOK -CPWD1(Essential) RRR-5 (Optional)
Lecture 21 Lecture 22 Lecture 23 Lecture 24	Schedule of Special Items for RRR works	HANDBOOK -CPWD1(Essential) RRR-5 (Optional)
Lecture 25 Lecture 26	Specifications for Structural Repair Work	HANDBOOK -CPWD1(Essential) RRR-5 (Optional) RRR-6 (Optional) RRR-7(Optional)
Lecture 27 Lecture 28	Site Requirement for RRR work	HANDBOOK -CPWD1(Essential) RRR-5 (Optional) RRR-6 (Optional) RRR-7(Optional)
Lecture 29 Lecture 23	Crack & Honeycomb Repair	HANDBOOK -CPWD1(Essential) RRR-5 (Optional)



		RRR-6 (Optional) RRR-7(Optional)
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Subject Coordinator contact details:

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Pin: 781013.
Website: www.aec.ac.in

For any query, please don't hesitate to contact me over phone or email.

The study materials for the entire subject have been developed and will be available electronically.



Cross-cultural analysis and capacity building in construction management practices focusing on housing and infrastructure sectors in Assam and Australia.

Academic Visitors' Tour Diary

Curriculum Development Programme for new Construction Management course at Assam Engineering College

Visitors

Dr. Jayanata Pathak (21st Aug. – 25th Sept.)

Dr. Bipul Talukdar (14th Aug. – 06th Oct.)

Melbourne University

2017



Smart Assam Project
Construction Management Programme at Assam Engineering College

Tour Diary of Visiting Scholar
Dr. Bipul Talukdar- during the period 13 August to 6 October, 2017 to University of Melbourne, Australia

Date	Activity	Descriptions
Day 1 : 13 August , 2017, Sunday	En route to Melbourne	Travelling: - Guwahati to Delhi by Jet Airways flight 9W 7068 (arrived at 6.35PM) - Stay overnight at Sankardev Bhawan, New Delhi.
Day 2: 14 August , 2017, Monday	En route to Melbourne	Travelling: - Delhi to Singapore by Qantas Airways QF 3954 - operated by Jet Airways (at 9:35 AM) - Arrived Singapore at 6:00 PM (Singapore local time) - Singapore to Melbourne by Qantas Airways QF 0036 (at 7:55 PM Singapore local time)
Day 3 : 15 August , 2017, Tuesday	Arrived Melbourne	- Arrived Melbourne at 5:20 AM (Melbourne local time) - Received by Mr. Nick at Melbourne Airport and driven to apartment (22 Dorcas St., Elm Apartment) - Took rest for few hours. - Went to market for household things.
Day 4 : 16 August , 2017, Wednesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	- Went to UoM (MSD) and met Dr. Hemanta Doloi. - Went to collect Staff Id card with Mr. Arup Deka. - Took charge of the allotted space for working. - Could not start work because of no accessibility to university network. - Advised Mr. Vikram Kumar regarding his forthcoming Assam visit.
Day 5 : 17 August , 2017, Thursday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	- Attended the fortnightly meeting of Smart Assam Project. - Discussed my plan of work with Prof. Ray Green, Dr. Robert Crawford, Dr. Hemanta Doloi. Mr. Jeoff, Mr. Arup Deka, Ms Valyne Katharpi and Mr. Vikram Kumar.



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DAY6 : 18 August , 2017, Friday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building	• Visited different locations of University. • Could not do any work for not getting computer access of the University. • Formalities completed for opening bank account at Commonwealth Bank, UoM Branch. • Went to Hemanta Doloi's residence.
DAY 7: 19 August , 2017, Saturday		Leisure days.
Day 8 : 20 August , 2017, Sunday		
Day 9: 21 August , 2017, Monday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building	• Shifted to 45 Clarke street • Got the Computer access. Started working for curriculum development.
Day 10 : 22 August , 2017, Tuesday	Arrived Melbourne Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	• Dr. Jayanta Pathak arrives from India • Took Dr. Jayanta Pathak to MoU and helped him to get Staff Identity Cards, opening of bank account at Commonwealth Bank, UoM Branch and helped him to get IT access to University system. • Meeting with Dr. Hemanta Doloi - Senior Lecturer (Construction Management) , Director and Leader (Smart Villages Lab Assam Project) over lunch at University House (Senior Lecturer in Property and Construction Management and Technology, FABP, UoM, PI of the Project • Meeting continued at Room 309 with Dr. Doloi Brief introduction about objectives of visit.
Day 11: 23 August , 2017,	Went to University of Melbourne (UoM), Melbourne School of	Room 344, MSD (Melbourne School of Design) Building Worked on the Curriculum development -



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Wednesday	Design Building (MSD), Architecture, Building and Planning (ABP).	Introduction to by Dr. Hemanta Doloi - Ms. Sally (to join shortly as the project Manager) Meeting and Discussion at Staff Kitchen, Level 4, MSD Building Dr. Hemanta Doloi Discussion about the scope of the project Meeting extended with Mr. Arup Deka (PhD Student-Assam Project, FABP, UoM) joining and later part of discussion was on his PhD work proposal.
Day 12 : 24 August , 2017, Thursday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building Subject development going on. Meeting and Discussion at Staff Kitchen, Level 4, MSD Building Dr. Hemanta Doloi - Discussion about the progress and contextualization of the proposed building at Majuli - Ms. Velyne Katharpi (PhD Student-Assam Project, FABP, UoM) introduced by Dr. Doloi and discussion on her PhD proposal.
DAY13 : 25 August , 2017, Friday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building Subject development going on. Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Meeting and Discussion at Staff Kitchen, Level 4, MSD Building Dr. Hemanta Doloi Discussion about the contents of the subject being dvelopment. Customization of the subject in the Indian context. - left ABP building along with Dr. Doloi.



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DAY 14 : 26 August , 2017, Saturday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building - To work half day today Subject development going on. Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Left ABP for Apartment : To attend Assamese community at Dr. Doloï's Residence in the evening : apprised the Assamese community about the Assam project and received response as input for developing the project.
DAY 15 : 27August , 2017, Sunday		Work from Apartment : Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY 16 : 28 August , 2017, Monday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development . Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY17: 29 August , 2017, Tuesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS Subject ongoing development by BP : ENGINEERING MATERIALS Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of



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		construction management at AEC.
DAY18: 30 August , 2017, Wednesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. 1:30 PM - 2:30 PM A visit to the University of Melbourne Library, Royal Melbourne Hospital, the Royal Children Hospital courtesy Ms. Manjita Doloi w/o Dr. Hemanta Doloi.
DAY 19: 31 August , 2017, Thursday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY 20: 01 September, 2017, Friday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY 21 02 September, 2017, Saturday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development Literature Survey



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		Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Attended a Mock presentation by Mr. Arup Deka (PhD Student-Assam Project, FABP, UoM) joining and later part of discussion was on his PhD work proposal. Left ABP Building for Apartment at 11 PM
DAY 22: 03 September, 2017, Sunday		Work from Apartment : Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY 23: 04 September, 2017, Monday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	11 AM Attended a Progress Presentation Seminar by - Mr. Arup Deka (PhD Student-Assam Project, FABP, UoM) Ms. Velyne Katharpi (PhD Student-Assam Project, FABP, UoM) Continued working after Seminar Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY24: 05 September, 2017, Tuesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 335 10 AM Meeting with Dr Robert Crawford - Senior Lecturer in Construction and Environmental Assessment Discussed and shared the work do till date regarding the course development work on CM. Dr. Crawford Shared his experiences of innovative instruction methods in teaching Construction Management subjects. Had discussion about involving industries for appropriate exposure of the processes in CM for students in the



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		proposed course in AEC. Meeting at Room 309 with Dr. Hemanta Doloi - Discussion about the Experimental Building at Majuli - The contextualisation of the proposed building - Selection of materials and discussion about technology transfer / sustainability of replications of the building A meeting with FrameCAD office, Melbourne arranged by Dr. Doloi on 12 Sept 2017 during the meeting, to understand the state-of-the-art of the methodology of LGS buildings, done by the company Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day25: 06 September, 2017, Wednesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day26: 07 September, 2017, Thursday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Attended a Progress Presentation Seminar by - Mr. Arup Deka (PhD Student-Assam Project, FABP, UoM) Ms. Velyne Katharpi (PhD Student-Assam Project,



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		FABP, UoM
Day27: 08 September, 2017, Friday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building Attended the Confirmation Presentation Seminar by - Ms. Velyne Katharpi (PhD Student-Assam Project, FABP, UoM) Mr. Arup Deka (PhD Student-Assam Project, FABP, UoM) at 1.00pm Meeting with Dr. Masa Noguchi, Assoc. Prof. in Sustainable Design, MSD. Exchange of ideas about each other's work . working on the Curriculum development Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day28: 09 September, 2017, Saturday		Worked from Apartment. Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day29: 10 September, 2017, Sunday		Leisure.
Day30: 11 September, 2017, Monday		Room 335 10 AM Meeting with Dr Robert Crawford - Senior Lecturer in Construction and Environmental Assessment Discussed and shared the work done till date regarding the course development work on CM. Discussed in detail about the course structure of Construction Management Programme at AEC.



Smart Villages Lab
Culture • Construction • Capacity • Community



**Smart Assam Project
Construction Management Programme at Assam Engineering College**

		1.30 – 2.30pm Discussed with Dr. Hemanta Doloi • Actions to be taken for design/contruction of the experimental prefab house at Majuli. • Course curriculum development at different levels of construction management programme. Room 344, MSD (Melbourne School of Design) Building Working on the Curriculum development – Subject taken : Building Construction.
Day31: 12 September, 2017, Tuesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	From University to FrameCAD office for design at 17-23 Ventura Pl, Dandenong South VIC 3175 Meeting with Mr. Evgueni Viritch of Dynamic Structure and Mr. Mohan for FrameCAD regarding the contextualization of the Experimental building at Majuli Visited the Factory and process of preparation of Cold formed section ,cutting for a give bnilding was explained
Day32: 13 September, 2017, Wednesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day33: 14 September, 2017, Thursday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	10 AM TO 11 AM <i>133 ABP L4 Meeting Room 408 Hansen Yuncken</i> <i>SKYPE Meeting with Mr. Tibor, along with Mr. Mohan</i> <i>Members Present Dr, hemanta Doloi, Dr. Bipul Talukdar, Dr. Jayanta Pathak</i> 11 AM to 12 AM <i>Assam Project: Fortnightly operations meeting</i> <i>Attended by Dr. Doloi, Dr. Talukdar, Dr. Pathak Prof. Ray Green, Dr. Robert Crawford, Prof. Dominique Hes, Mr. Jeff, Mr. Vikram, Sally Maree Donovan, Velyine Kathar and Arup Deka</i> 3 PM to 3:30 PM <i>Assam Academic Visitors meeting with Dean</i>



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		<i>Hemanta, Professor Pathak and Professor Talukdar ABP L1 Dean's Conference Room 102</i>
Day 34: 15 September, 2017, Friday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day 35: 16 September, 2017, Saturday	Work from Apartment Literature Survey	Work from Apartment : Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day 36: 17 September, 2017, Sunday	Leisure	
Day 37: 18 September, 2017, Monday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Literature Survey and course development Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Worked on the New course (3R in Construction) - developed jointly with Dr. Pathak.
Day 38: 19 September, 2017, Tuesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	12:30 – 2:00pm MSD-244.Construction staff meeting Attended and observed the discussion. Participated in Assam Project Discussion with the Faculty members of the Department
Day 39: 20 September, 2017, Wednesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	12 AM Lunch meeting With Mr. Mohan from FrameCAD, Dr. Doloi, Dr. Talukdar, Dr. Pathak regarding Majuli Building Graduate House, 220 Leicester St, Carlton
Day 40:	Went to University of	Literature Survey



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21 September, 2017, Thursday	Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Worked on the New course (3R in Construction) - developed jointly with Dr. Pathak.
Day 41: 22 September, 2017, Friday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Worked on the New course (3R in Construction) - developed jointly with Dr. Pathak.
Day 42: 23 September, 2017, Saturday	Work from Apartment Literature Survey	Work from Apartment : Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Worked on the New course (3R in Construction) - developed jointly with Dr. Talukdar.
Day 43: 24 September, 2017, Sunday	Leisure	
Day 44: 25 September, 2017, Monday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Worked on the New course (3R in Construction) - developed jointly with Dr. Pathak.
Day45: 26 September, 2017, Tuesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Worked on the New course (3R in Construction) - developed jointly with Dr. Pathak.
Day46: 27 September,	Went to University of Melbourne (UoM), Melbourne School of	Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of



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2017, Wednesday	Design Building (MSD), Architecture, Building and Planning (ABP).	construction management at AEC. Worked on the New course (3R in Construction) - developed jointly with Dr. Pathak.
Day 47: 28 September, 2017, Thursday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	11 AM to 12 AM <i>Assam Project: Fortnightly operations meeting</i> <i>Attended by Dr. Doloi, Dr. Talukdar, Dr. Pathak Prof.</i> <i>Ray Green, Dr. Robert Crawford, Prof. Dominique</i> <i>Hes, Mr. Jeff, Mr. Vikram, Sally Maree Donovan,</i> <i>Velyine Kathar and Arup Deka</i> Work completed on all the three New courses and editorial corrections are done. The Academic Visitors' Report has been prepared and finalised with Dr. Doloi.
Day 48: 29 September, 2017, Friday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Printing, binding of the Academic Visitors' Report was done.
Day 49: 30 September, 2017, Saturday	Leisure	Working from Apartment. Course curriculum planning for CM course in Assam Engineering College.
Day43: 01 October, 2017, Sunday	Leisure	
Day44: 02 October,, 2017, Monday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Course curriculum design for CM course in Assam Engineering College. • Certificate course • PG Diploma course and • Masters course.
Day45: 03 October,2017, Tuesday	Leisure	Tour to Sydney and working on Course curriculum design for CM course in Assam Engineering College.
Day46:	Leisure	Tour to Sydney and working on Course curriculum



Smart Villages Lab
Culture • Construction • Capacity • Community



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04 October, 2017, Wednesday		design for CM course in Assam Engineering College.
Day47: 05 October, 2017, Thursday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Arrived Melbourne from Sydney in the Morning. Went to ABP. Met Dr. Doloi and summed up all the works and handed over to him.
Day48: 06 October, 2017, Friday	Leaving Melbourne after completion of Academic Visit	Travelling: Melbourne to Delhi by Qantas and Jet Airways flight via Singapore Stay overnight at Delhi at Hotel, Near Airport



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Tour Diary of Visiting Scholars
Dr.Jayanta Pathak - during the period 20 August to 25 September, 2017
to University of Melbourne, Australia

Date	Activity	Descriptions
Day 1 : 20 August , 2017, Sunday	En Route to Melbourne	Travelling: - Guwahati to Delhi by Jet Airways flight 9W 7068 (arrived at 6.35PM) - Stay overnight at Delhi at Lohmod Hotel, Near Airport
Day 2: 21 August , 2017, Monday	En Route to Melbourne	Travelling: - Delhi to Singapore by Qantas Airways QF 3954 - operated by Jet Airways (at 9:35 AM) - arrived Singapore at 6:00PM (Singapore local time) - Singapore to Melbourne by Qantas Airways QF 0036 (at 7:55 PM Singapore local time)
Day 3 : 22 August , 2017, Tuesday	Arrived at Melbourne Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	- Arrived Melbourne at 5:20 AM (Melbourne local time) - Received by Mr. Nick at Melbourne Airport and driven to apartment (45 Clarke Street , Platinum Apartment) - Received by Dr.Bipul Talukdar, Academic Visitor from AEC , who arrived at Melbourne one week earlier (Dr.Talukdar arrived one week before) - Attended the place of work by 9:45 AM, Introduced to the University System by Dr.Bipul Talukdar - Staff Identity Cards were issued (ID-128796) - Formalities completed for opening bank account at Commonwealth Bank, UoM Branch - Formalities completed for IT access to University system completed and access established. Meeting at level 3 , Room 309, Melbourne School of Design Building: - Meeting with Dr.Hemanta Doloi- Senior Lecturer



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		(Construction Management) , Director and Leader (Smart Villages Lab Assam Project)over lunch at University House (Senior Lecturer in Property and Construction Management and Technology, FABP, UoM, PI of the Project Meeting continued at Room 309 with Dr.DoloiBrief introduction about objectives of visit.
Day 4 : 23 August , 2017, Wednesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building Started working on the Curriculum development - Subject taken up by JP : BUILDING REGULATIONS Subject ongoing development by BP : ENGINEERING MATERIALS Introduction to by Dr.HemantaDoloi - Professor Ray Green (Professor in Landscape Architecture and Heritage, FABP, UoM), - Ms. Sally (to join shortly as the project Manager) Meeting andDiscussion at Staff Kitchen, Level 4, MSD BuildingDr.HemantaDoloi Discussion about the scope of the project Meeting extended with Mr. Arup Deka (PhD Student-Assam Project, FABP, UoM) joining and later part of discussion was on his PhD work proposal.
Day 5 : 24 August , 2017, Thursday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS Meeting and Discussion at Staff Kitchen, Level 4, MSD Building Dr.HemantaDoloi - Discussion about the progress and contextualization of the proposed building at Majuli - Ms. VelyneKatharpi (PhD Student-Assam Project, FABP, UoM) introduced by Dr.Doloi and discussion on her PhD proposal.
DAY6 : 25 August ,	Went to University of Melbourne (UoM),	Room 344, MSD (Melbourne School of Design) Building



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2017, Friday	Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Meeting and Discussion at Staff Kitchen, Level 4, MSD Building Dr.HemantaDoloi • Discussion about the contents of the subject being development. • Customization of the subject in the Indian context. • left ABP building along with Dr.Doloi.
DAY7 : 26 August , 2017, Saturday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building - To work half day today working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Left ABP for Apartment : To attend Assamese community at Dr.Doloi's Residence in the evening : apprised the Assamese community about the Assam project and received response as input for developing the project.
DAY8 : 27 August , 2017, Sunday		Work from Apartment : Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY9 :	Went to University of	Room 344, MSD (Melbourne School of Design)



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28 August , 2017, Monday	Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY10: 29 August , 2017, Tuesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY11: 30 August , 2017, Wednesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. 1:30 PM - 2:30 PM A visit to the University of Melbourne Library, Royal Melbourne Hospital, the Royal Children Hospital courtesy Ms. ManjitaDoloi w/o Dr.HemantaDoloi.
Day12: 31 August , 2017, Thursday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS



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	and Planning (ABP).	Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY13: 01 September, 2017, Friday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY14: 02 September, 2017, Saturday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS – Content development completed – Reading / Teaching materials organisation ongoing work on the second subject by JP : CONTRACT MANAGEMENT started Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Attended a Mock presentation by Mr. Arup Deka (PhD Student-Assam Project, FABP, UoM) joining and later part of discussion was on his PhD work proposal. Left ABP Building for Apartment at 11 PM
DAY15: 03 September,	Work from Apartment : Literature Survey	Work from Apartment : Literature Survey Online survey of relevant literature in line with the



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2017, Sunday		development of the master's course curriculum of construction management at AEC.
DAY16: 04 September, 2017, Monday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	11 AM Attended a Progress Presentation Seminar by - Mr. Arup Deka (PhD Student-Assam Project, FABP, UoM) Ms. VelyneKatharpi (PhD Student-Assam Project, FABP, UoM) Continued working after Seminar Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS – Content development completed – Reading / Teaching materials organisation ongoing work on the second subject by JP : CONTRACT MANAGEMENT started Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
DAY17: 05 September, 2017, Tuesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 335 10 AM Meeting with Dr Robert Crawford - Senior Lecturer in Construction and Environmental Assessment Discussed and shared the work do till date regarding the course development work on CM. Dr. Crawford Shared his experiences of innovative instruction methods in teaching Construction Management subjects. Had discussion about involving industries for appropriate exposure of the processes in CM for students in the proposed course in AEC. Meeting at Room 309 with Dr.HemantaDoloi - Discussion about the Experimental Building at Majuli - The contextualisation of the proposed building - Selection of materials and discussion about



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		technology transfer / sustainability of replications of the building A meeting with FrameCAD office, Melbourne arranged by <u>Dr.Doloi on 12 Sept 2017</u> during the meeting, to understand the state-of-the-art of the methodology of LGS buildings, done by the company Introduction to Dr Masa Noguchi, Associate Professor in Environmental Design, Faculty of Architecture, Building and Planning, by Dr H. Doloi Room No. 316 – Meeting with Dr. Masa along with Dr. B. Talukdar- Discussion about probable introduction of Design concept development through ZEMCH Workshop: Dr. Masa was apprised about Flood and Earthquake Risk by Dr.Talukdar and Dr. Pathak and suggested to take advice from Dr.Doloi regarding workshop. Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS – Content development completed – Reading / Teaching materials organisation ongoing work on the second subject by JP : CONTRACT MANAGEMENT started Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day18: 06 September, 2017, Wednesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS – Content development completed – Reading / Teaching materials organisation ongoing



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		work on the second subject by JP : CONTRACT MANAGEMENT started Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day19: 07 September, 2017, Thursday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS – Content development completed – Reading / Teaching materials organisation ongoing work on the second subject by JP : CONTRACT MANAGEMENT started Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day20: 08 September, 2017, Friday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS – Content development completed – Reading / Teaching materials organisation ongoing work on the second subject by JP : CONTRACT MANAGEMENT started Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. 11:00 AM Attended Confirmation Seminar by - Ms. VelyneKatharpi (PhD Student-Assam Project, FABP, UoM) 1:00 PM Attended Confirmation Seminar by – Mr. Arup Deka (PhD Student-Assam Project, FABP, UoM)



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		1:40 PM Staff Kitchen – Meeting with Dr Masa Noguchi , Associate Professor in Environmental Design Dr. Masa explained the concept of Plug-in houses / Dr Masa was apprised of the Building Typology work and Risk assessment done by Dr. Pathak for Guwahati and Assam.
Day21: 09 September, 2017, Saturday	Work from Apartment : Literature Survey	Work from Apartment : Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day22: 10 September, 2017, Sunday	Leisure	
Day23: 11 September, 2017, Monday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	10 AM -11 AM Follow up Meeting with Dr Robert Crawford - Senior Lecturer in Construction and Environmental Assessment Shared the work do till date regarding the course development work on CM. Discussed about the course structure and development strategy for CM programme at AEC. Shared the course modules of the existing PG programme at AEC. Dr. Crawford also provided details of the course coordinators at FABP for the subject being developed (Building Regulations and Contract Management) Room 344, MSD (Melbourne School of Design) Building working on the Curriculum development - Subject taken by JP : BUILDING REGULATIONS – Content development completed – Reading / Teaching materials organisation ongoing work on the second subject by JP : CONTRACT MANAGEMENT started Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of



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		construction management at AEC. 1:30-2:30 PM Discussion with Dr. Hemant Doloi at Staff Kitchen Room - Discussion on Activity and Action Chart with Identification of Experts and Expert inputs for the Experimental Building in Majuli - Discussion about structuring the PG course in CM Programme / Course at various grades and levels - viz. Certificate level, PG Diploma level, PG Degree level
Day24: 12 September, 2017, Tuesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	From University to FrameCAD office for design at 17-23 Ventura Pl, Dandenong South VIC 3175 Meeting with Mr. Evgueni Viritch of Dynamic Structure and Mr. Mohan for FrameCAD regarding the contextualization of the Experimental building at Majuli Visited the Factory and process of preparation of Cold formed section ,cutting for a give bnilding was explained
Day25: 13 September, 2017, Wednesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day26: 14 September, 2017, Thursday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	10 AM TO 11 AM 133 ABP L4 Meeting Room 408 Hansen Yuncken SKYPE Meeting with Mr. Tibor, along with Mr. Mohan Memebbers Predsent Dr, hemanta Doloi, Dr. Bipul Talukdar, Dr. Jayanta Pathak 11 AM to 12 AM Assam Project: Fortnightly operations meeting Attended by Dr. Doloi, Dr. Talukdar, Dr. Pathak Prof. Ray Green, Dr. Robert Crawford, Prof. Dominique Hes, Mr. Jeff, Mr. Vikram, Sally Maree Donovan, Velyine Kathar and Arup Deka 3 PM to 3:30 PM Assam Academic Visitors meeting with Dean



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		<i>Hemanta, Professor Pathak and Professor Talukdar</i> <i>ABP L1 Dean's Conference Room 102</i>
Day27: 15 September, 2017, Friday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day28: 16 September, 2017, Saturday	Work from Apartment : Literature Survey	Work from Apartment : Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC.
Day29: 17 September, 2017, Sunday	Leisure	
Day30: 18 September, 2017, Monday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Literature Survey and course development Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Worked on the New course (3R in Construction) - developed jointly with Dr. Talukdar.
Day31: 19 September, 2017, Tuesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	12:30 – 2:00pm MSD-244.Construction staff meeting Attended and observed the discussion. Participated in Assam Project Discussion with the Faculty members of the Department
Day32: 20 September, 2017, Wednesday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	12 AM Lunch meeting With Mr. Mohan from FrameCAD, Dr. Doloi, Dr. Talukdar, Dr. Pathak rding Majuli Building Graduate House, 220 Leicester St, Carlton
Day33:	Went to University of	Literature Survey



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21 September, 2017, Thursday	Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Worked on the New course (3R in Construction) - developed jointly with Dr. Talukdar.
Day34: 22 September, 2017, Friday	Went to University of Melbourne (UoM), Melbourne School of Design Building (MSD), Architecture, Building and Planning (ABP).	Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Worked on the New course (3R in Construction) - developed jointly with Dr. Talukdar.
Day35: 23 September, 2017, Saturday	Work from Apartment : Literature Survey	Work from Apartment : Literature Survey Online survey of relevant literature in line with the development of the master's course curriculum of construction management at AEC. Worked on the New course (3R in Construction) - developed jointly with Dr. Talukdar.
Day36: 24 September, 2017, Sunday	Leisure	
Day37: 25 September, 2017, Monday	Leaving Melbourne after completion of Academic Visit	Travelling: Melbourne to Delhi by Qantas and Jet Airways flight via Singapore Stay overnight at Delhi at Hotel, Near Airport

