Annex A

COURSE CONTENT

Academic Year	AY2017-18	**Semester**	1
Course Coordinator	Assoc Prof Robert Tiong		
Course Code	CV4119		
Course Title	Advanced Prefabrication and Precast Construction		
Pre-requisites	CV3011 Reinforced Concrete Design		
No of AUs	3		
Contact Hours	Total : 39 Hours (Lectures: 39 hrs)		
Proposal Date	2 February 2017		

Course Aims

The aim of this course is to keep you up to date with current and emerging advanced construction methods/game-changing construction technologies. You will attain an overall picture of Advanced Prefabrication and Precast Construction with a good understanding of the offsite construction issues and gain an insight in constructing sustainable civil, industrial, offshore and building type projects.

Intended Learning Outcomes (ILO)

By the end of this course, you (as a student) would be able to:

1. give an overview/background of advanced construction methods/technologies
2. apply the design principles/ considerations for Prefabrication and Precast Construction
3. design models for manufacturing and assembly
4. apply the principles of modular construction and standardization
5. select productive/efficient construction method and equipment for project execution
6. apply Building Information Model (BIM) and Virtual Design & Construction (VDC) for the Design for Manufacturing & Assembly (DfMA)

Course Content

Propose Course outline:

S/N	Topic	Lecture Hrs	Tutorial Hrs
1.	What is prefabrication and precast construction – concepts and system evolution	3	
2.	Modular coordination and standardisation	3	
3.	Design considerations for prefabrication and precast construction	6	
4.	Design of precast tall buildings	6	
5.	Precast Mould systems	6	
6.	Good practice in precast construction	3	
7.	Special projects and case studies : a) Design of Precast buildings, and b) PPVC building system	6	
8.	BIM and VDC for DfMA	6	
	Total:	39	0

Brief Description:
In a building construction project, the selection of construction method and equipment are important considerations that can affect project execution, productivity, quality, safety and cost. This course gives an overview/background of the advanced construction methods/technologies available in civil engineering, industrial, offshore and building type projects, and the considerations in equipment selection. It also introduces the basic design considerations, advanced construction technologies, productivity improvement methods, BIM/VDC implementation and optimization methods related to allocation of resources, transportation, process planning and inventory checking and usage of digital design data. Specific topics include Prefabrication and Precast Construction methods, planning for Prefabrication and Precast construction, Design of precast and Modular coordination, DfMA/PPVC/PBU, equipment planning and selection, and systems analysis and optimization. Some practical works and case studies will be discussed to illustrate the applications of Advanced Prefabrication and Precast Construction, the realized benefits and lessons learned from project implementation.

Assessment (includes both continuous and summative assessment)

Component	Course LO Tested	Related Programme LO or Graduate Attributes	Weightage	Team / Individual	Assessment Rubrics
1. Final Examination	1, 2, 3, 4, 5, 6	EAB SLO a, c, d	60%	Individual	
2. Continuous Assessment 1 (CA1): Tutorial 1 and 2 (computational)	1,2,3,4,5	EAB SLO a, c, d, l	20%	Individual	
3. CA2: Booklet Laboratory Project	Each individual to compile a booklet to capture the learning points covered under 1,2,3,4,5,6	EAB SLO a, c, d, l	20%	Individual	Appendix 1
Total			100%		

The EAB SLOs are:

(a) **Engineering knowledge**: Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.
(b) **Problem Analysis**: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

(c) **Design/development of Solution**s: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

(d) **Investigation**: Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

(e) **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

(f) **The engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

(g) **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.

(h) **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

(i) **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.

(j) **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

(l) **Life-long Learning**: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Formative feedback

Feedback will be given to you for your quiz and project during class.

Learning and Teaching approach

Approach	**How does this approach support students in achieving the learning outcomes?**
Lecture	Formal lectures on the topics with in-class discussions
Booklet documentation & Sharing	This helps you to achieve one or more of the learning outcomes as youneed to do self-study and research. Sharing will help yous to enhance your understanding and get new perspectives.

Reading and References

Summary of materials will be extracted for reading and reference ;-

Blueprints for Successful Public Housing Development, Lau Joo Ming, 2006

HDB Prefab Systems, R and D works and its experience

Research works on precast technology of World renowned Dr Alfred Yee and Dr CW Yu

Recent experience of DFMA, BIM, PPVC

Structural Precast Handbook, Building Construction Industry , 2001

For further reference

Chudley, R. and Greeno, R. "Advanced Construction Technology", 5th edition, Pearson, 2012.

Chuck Eastman, Paul Teicholz, Rafael Sacks, and Kathleen Liston, "BIM Handbook- A Guide to Building Information Modeling for owners, managers, designers, engineers and contractors" second edition, John Wiley & Sons, Inc. 2011.

Course Policies and Student Responsibilities

(1) General

Students are expected to take all scheduled assignments and tests by due dates. Students are expected to take responsibility to follow up with course notes, assignments and course related announcements. Students are expected to participate in all group project discussions and activities.

(2) Absenteeism

Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies. There will be no make-up opportunities for in-class activities.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any

of these terms, you should go to the academic integrity website for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors AY2017/18

Instructor	Office Location	Phone	Email
A/P Tiong Lee Kong Robert	N1-01c-72	6790 5253	CLKTIONG@ntu.edu.sg

Planned Weekly Schedule

Week	Topic	Course LO	Readings/ Activities
1	Basic concepts on prefabrication and precast construction –system evolution	1	Tutorial and lectures
2	Modular coordination and standardisation	2	Tutorial and lectures
3	Design considerations for prefabrication and precast construction	2	Tutorial and lectures
4	Design considerations for prefabrication and precast construction	2	Tutorial and lectures
5	Design of precast tall buildings	3	Tutorial and lectures
6	Design of precast tall buildings	3	Tutorial and lectures
7	Precast Mould systems	4	Tutorial and lectures
8	Precast Mould systems	4	Tutorial and lectures
9	Good practice in precast construction	5	Tutorial and lectures
10	Case studies : a) Design of Precast buildings	5	Tutorial and lectures
11	Case studies : b) PPVC building system	6	Tutorial and lectures
12	BIM and VDC for DFMA	6	Tutorial and lectures
13	BIM and VDC for DFMA	6	Tutorial and lectures

Appendix 1: Assessment Criteria for Individual Project Report

Each group chooses a topic which may be one of course intended learning outcomes 2, 3, 4, 5 or 6.

Criteria	Good (4)	Ave (3)	Fair (2)	Poor (1)	Very Poor (0)	Remarks
Introduction/Project Background and Project Objectives/Purpose (20%)						Accurate analysis of project background and description. Well defined project; clear objectives.
Methodology/experiment (20%)						Basic knowledge and application of appropriate approaches towards air pollution monitoring
Results and Discussion (25%)						Well-presented results with discussion showing the ability to evaluate the performance of the air sampling device and analysis.
Conclusion and Recommendation (25%)						Summarize the report clearly and concisely; apply appropriate approach to improve the monitoring; clear and workable recommendations
Reference and Report format and layout including clarity of expression / Style of report (10%)						Clear and concise; good grammar and spelling with appropriate Tables/graphs/Figures; Report are presented well with logical sequence
TOTAL						