Subject Description Form

Subject Code	**BSE3714**
Subject Title	Building Services Systems Design
Credit Value	4
Level	3
Pre-requisite Co-requisite Ex-requisite	BSE3225 HVACR I, BSE3123 Power Distribution, BSE3321 Fire Services, BSE3312 Piped Services, BSE3226 HVACR II, BSE318 Lighting Technology Nil Nil
Objectives	• To integrate knowledge and skills of the multi-disciplinary building services systems learned in the earlier stages of the programme. • To enable students to be competent in playing the role of a building services engineer in a design team with due consideration of installation, commissioning, operation and maintenance of building services systems in the dimensions of technical justifications, environmental awareness and project planning.
Intended Learning Outcomes	Upon satisfactory completion of the subject, students will be able to: a. develop discipline designs adhering to imposed design constraints, performance requirements and statutory requirements; b. handle problem-solving and decision-making over a range of BSE systems; c. apply professional approach in carrying out integrated system design tasks; d. carry out sensitivity analysis to determine relative importance of various design parameters; e. analyze and rationalize design alternatives; f. contribute to the building design process taking into account the architectural features and the integration between building and services systems; g. work productively in a team and develop personal, technical and managerial abilities by taking responsibility for the services systems; and h. communicate to others in a clear and concise manner through written reports, drawings and oral presentation.
Subject Synopsis/ Indicative Syllabus	This subject is supplementary to the Level 3 building services subjects. The subject teaching scheme is co-ordinated with related subjects to provide coherence and proper sequence of the integrated design of the systems matching with topics covered in lectures. Students will have to demonstrate design competency, co-ordination and management of the design process in relation to air-conditioning and ventilation systems, lighting, power supply and distribution, fire systems and piped services. In carrying out the design tasks, students are required to demonstrate critical thinking and professional judgment, embracing integration between the services systems and with architectural features. A sample building will be used as a vehicle to learn and practise design tasks in a design team as in the real world. The system design development shall cover users' need, system specifications, energy efficient appraisal, environmental and economic impacts of different options, space constraints and client's requirements. Deliverables: Design report addressing justification for system selection, considerations on environmental impacts, energy efficiency, safety, integration of building and system, etc.; supporting calculations and system sizing; schematic diagrams and layout drawings.

Teaching/Learning Methodology	Students will work in teams of three members on the system design development for a given building, under the supervision and guidance of design tutors. The integrated system design adheres closely to RIBA Plan of Work Stages 1 to 3, i.e. from site appraisal and feasibility studies to developed design, which contains schematic diagrams, layout drawings, justification and rationalisation of design alternatives proposed during the design process. It will also include references to relevant building performance design codes and guidelines. Guest seminar talks by distinguished practitioners and experienced practicing engineers with substantial design experience will be arranged to assist the students' appreciation of the integration concept. Design tasks using specific design knowledge and computer aided tool skills are also trained throughout the course. Students are required to develop system schemes for the whole building and main routing of services run for representative floors or selected areas of the given building. Through the tasks students will become familiar with the integrated design of major systems, code of practice and the effects of making changes in design parameters, alternative materials, and sources of design data. Students are required to manipulate the use of trade practice and design software in line with the building industry. Learning approach will be in the form of meeting with experienced practicing engineers, tutors, lectures, peer learning, design clinic and seminars on a regular basis. Application of CAD software in integrated systems design is also part of the curriculum. Emphasis is put on integration with other knowledge learned in the previous stages in relation to the system design, e.g. architecture and building, fluid mechanics, heat and mass transfer in buildings, thermal comfort, visual and acoustic aspects, indoor air quality, fire safety, communication, CAD and engineering management.
Assessment Methods in Alignment with Intended Learning Outcomes	

Specific assessment methods/tasks	weighting %	Intended subject learning outcomes to be assessed (Please tick as appropriate)							
		a	b	c	d	e	f	g	h
1. Outline design report (group effort)	40	✓	✓	✓	✓	✓	✓	✓	✓
2. Integrated system design report (individual effort)	40	✓	✓	✓	✓	✓	✓	✓	✓
3. Progress (individual effort)	10	✓	✓			✓	✓	✓	✓
4. Oral presentation (individual effort)	10							✓	✓
Total	100 %								

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

The students are assessed based on an outline design report, an integrated system design report including worksheets, design calculation results, extracts of design software outputs, CAD drawings, intermediate progress and a final oral presentation.

	Submission	Assessment Elements

	Submission in week 10 (Semester 2) (One group Report)	Outline design report	Appraisal of site constraints and environment around the building location; considerations of users' need, environmental impact, sustainability, safety and health issue; space utilization for major plant rooms as well as vertical distribution of services; rationales and justifications for system selection; loading estimation and main system sizing; preliminary system design in form of schematic diagrams; considerations of commissioning, operation and maintenance.
	Submission in week 7 (Summer Term) (One individual report)	Integrated system design report	Understanding of the regulatory requirements and different aspects of utility, site and client constraints; technical engineering competence in system selection, equipment sizing and services design; integration among different services in terms of services accommodation, system sizing and interface design; methods and data for system design and sizing calculation; mathematical portrayal of detailed design calculations in form of tables or summary sheets; application of computer design software; technical accuracy and professional presentation of system design in form of schematics and layout drawings.

Student Study Effort Expected	Class contact:	
	• Lectures/Tutorials	12 Hrs.
	• Workshop/Progress Check	24 Hrs.
	• Technical Talk/Seminar/Presentation	14 Hrs.
	• Site Visit	2 Hrs.
	Other student study effort:	
	• Design development / Report preparation	100 Hrs.
	• Preparation for oral presentation	4 Hrs.
	Total student study effort	156 Hrs.

Reading List and References

Benjamin, S., John, S.R. & William, J.M. (2006). Mechanical and Electrical Equipment for Buildings. (10th ed.). Hoboken, N.J.: Wiley. ISBN/ISSN: 0471465917.

John, K. & Peter, J. (2004). Newnes Building Services Pocket Book. (2nd ed.). Oxford: B.H. Newnes. ISBN/ISSN: 0750657855.

Parsloe, C. (1990). A Design Briefing Manual. BSRIA. ISBN/ISSN: 9780860222668.

Sebastian, M. (2004). Designing Better Buildings: Quality and Value in the Built Environment. Taylor & Francis. ISBN/ISSN: 0415315255.

Walter, G (2007). Air-conditioning System Design Manual. (2nd ed.). American Society of Heating, Refrigerating and Air-Conditioning Engineers, Atlanta, GA. ISBN/ISSN: 9781933742137.

Walter, T (2010). Mechanical and Electrical Equipment for Buildings. (11th ed.). Hoboken, N.J.: Wiley. ISBN/ISSN: 9786612348396.