**Short Form Unit Details**

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| Unit Title | Structures and Surveying |
| Level | 4 |
| Reference No.*(showing level)* | EUC-4-957 |
| Credit Value | 30 |
| Student Study Hours | Contact hours: 78Student managed learning hours: 222 |
| Pre-requisite learning |  |
| Co-requisites |  |
| Excluded combinations |  |
| Unit co-ordinator | Mahmood Datoo |
| Faculty/Department | ESBE/Urban Engineering |
| Short Description | This unit combines Structures with Surveying.Structures: The fundamentals of structural mechanics and strength of materials are taught and numerous worked examples are used to complement the understanding. Students are taught methods of calculating section properties, shear force and bending moment diagrams, and stresses arising from axial, bending, shear and tensional loads on determinate structures. A computer aided analysis package is introduced. Surveying: Students are introduced to principles of surveying, and Setting out including distance and angular measurements, levelling, volume and curve calculation, dimensional control and positioning The students will use various surveying instruments including tapes, levels, Theodolite/Total Stations. The students are also introduced to modern advances in surveying technology such as GPS and LASERS and their uses in civil engineering and construction. Knowledge is acquired through computational exercises and completion of a practical survey work. |
| Aims | * to develop an appreciation and understanding of the fundamentals of structural mechanics
* to develop and apply surveying principles in positioning and dimensional control of structures
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| Learning Outcomes | **Knowledge and Understanding**:* understand the fundamentals of structural mechanics
* understand the different structural elements, load types and support conditions
* understand principles of surveying and applications in civil engineering.
* understand the use of distance and angular measurements in dimensional control and positioning of structures.
* understand how advances in technology have affected surveying practice.

**Intellectual Skills**:* calculate section properties, shear forces and bending moments determinate structures
* perform stress analysis on determinate beans subjected to axial, shear, bending and tensional loads
* measure distances ,angles and levels for dimensional control and setting out
* calculate bearings, coordinates, volumes and curves

**Practical Skills**:* usage of a computer aided analysis package and interpretation of results
* perform, analyse and interpret results from laboratory experiments
* use surveying skills to carry out site survey, levelling, angular measurements, establishment of control for engineering/construction projects and setting out

**Transferable Skills**:* appreciate load paths in complex structures
* significance of stresses induced by different load types
* apply mathematical and practical skills to dimensional control and positioning
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| Employability | Students become competent at analysis of structures, use software to check their results, and are familiar with surveying principles and applications, all of which should improve their chances at finding employment. |
| Teaching and learning pattern | Lectures and tutorials supplemented by printed handouts and supported by laboratory experiments. Lectures (Structures) 20Tutorials (Structures): 19Lectures (Surveying)): 12Fieldwork (Surveying): 27**Total contact hours: 78**Fieldwork (Surveying): 60Tests (Surveying): 2Lab Report (Structures): 10Private study: 150**Total student managed learning hours: 222** **Total learning hours: 300** There will be an emphasis on problem-solving activities to illustrate the principles and concepts of structural analysis and surveying. This will be used extensively in the lecture programme and will be further supported in regular tutorial sessions. Field work projects and demonstrations of advanced equipment by visiting surveying instrument specialist. |
| Indicative content | ***Structures:*****Load and Support Types**Point loads, uniformly distributed loads, varying loads, axial, shear, bending, and torsion. Simple, pinned, roller, fixed.**Equilibrium**Fundamental principles of static equilibrium, reactions.**Section Properties**Area, centroid, second moment of inertia, parallel axes theorem, radius of gyration, elastic section modulus.**Analysis of Determinate Beams and Frames**Reactions, shear force diagrams, bending moment diagrams, location of maximum bending moment.**Pin Jointed Frames**Method of joints to calculate member forces.**Stress and Strain**The nature and definition of stress and strain, and the relationships between them. Relationships between the elastic constants. Analysis of stress and strain.**Axial Stress**Derivation and application of axial stress**Bending Stress**Derivation and application of bending stress**Combined Stress**Combined stress due to axial and bending.**Shear Stress**Complementary shear stress. Derivation and application of shear stress from shear loads. Shear stress distribution.**Torsion**Torsional stresses in circular shafts.***Surveying:*****Principles of Surveying**Linear measurement, tape and offset surveying**Levelling**Use of the level in surveying and setting out. Standard methods of reduced level calculations/ check and adjustment.**The Theodolite/ Total Stations**Use of Theodolite and Total stations for precise angular and distance measurement for surveying, establishment of control and positioning. **Coordinates**Calculation of Easting and Northing’s from measured distances and angles in traversing**Curve Geometry**Curve setting out calculations.**Area and Volume**Calculation of areas and volumes for construction applications. |
| Assessment*Elements & weightings* | 50% 2 hour end of unit examination (Structures)25% Coursework 1 - Surveying Fieldwork20% Coursework 2 - Surveying Tests – individual and supervised5% Coursework 3 - laboratory testing of an I-section subjected to combined axial and bending. |
| Indicative Sources*(Reading lists)* | **Core*** Bannister, A, Raymond, S, and Baker, R, Surveying, 7th Edition, Longman, 1998
* Hulse, Sherwin and Cain, J, Solid Mechanics, Palgrave, 2003.
* Irvine, W, Surveying for Construction, 4th edition, McGraw Hill, 1995
* Smith, P., Introduction to Structural Mechanics, Palgrave, 2001.
* Megson, T.H.G., Structural and Stress Analysis, Elsevier Butterworth Heineman, 2005.
* MDSolids software

**Optional*** Bannister, A and Baker, R, Solving Problems in Surveying, 2 nd Edition, Longman, 1994
* Bhatt, P., Marshal and Nelson’s Structures, 3rd edition, Longman, 1990.
* Clancy, J, Site Surveying and Levelling, 2nd Edition, Edward Arnold, 1991
* Croxton P.C.L. and Martin L.H., Solving Problems in Structures, Vol 1, Longman, 1990.
* Durka F., Nageim H., Morgan W., and Williams D., Structural Mechanics, 6th edition, Prentice Hall, 2003.
* Muskett, J, Site Surveying, BSP Professional Books, 1988
* Wilson, R J P, Land Surveying, 3rd Edition, MacDonald and Evans, 1983
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