**Faculty of Technology – Coursework Brief 2018/19**

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| **Module name:** | | Introduction to Shader Programming | | | | |
| **Module code:** | | IMAT2908 | | | | |
| **Title of the Assignment:** | | Full Phong Shading | | | | |
| **This coursework item is:** | | | | Summative | | |
| **This summative coursework will be marked anonymously:** (delete as appropriate) | | | | | No | |
| **The learning outcomes that are assessed by this coursework are:**   1. To research and explain the principle of full Phong shading 2. To design, write, test and debug a C++/GLSL program to implement full Phong shading 3. To write a well-structured and coherent report on the above 4. To complete an individual design and development project on an individual basis | | | | | | |
| This coursework is: | | | Individual | | | |
| **This coursework constitutes** 100 % **of the overall module mark.** | | | | | | |
| **Date Set:** | 5th December 2018 | | | | | |
| **Date & Time Due:** | 29th April 2019 15:00 (3:00 PM) | | | | | |
| **Your marked coursework and feedback will be available to you on:** If for any reason this is not forthcoming by the due date your module leader will let you know why and when it can be expected. The Associate Professor Student Experience (CEMstudentexperience@dmu.ac.uk) should be informed of any issues relating to the return of marked coursework and feedback.  Note that you should normally receive feedback on your coursework by **no later than 20 University working days after the formal hand-in date,** provided that you have met the submission deadline. | | | | | | 20th May 2019 |
| **When completed you are required to submit your coursework via:**   1. Github code Submission 2. Turnitin report submission   **If you need any support or advice on completing this coursework please visit the Student Matters tab on the Faculty of Technology Blackboard page.** | | | | | | |
| **Late submission of coursework** **policy:** Late submissions will be processed in accordance with current University regulations which state:*“the time period during which a student may submit a piece of work late without authorisation and have the work capped at 40% [50% at PG level] if passed is* ***14 calendar days****. Work submitted unauthorised more than 14 calendar days after the original submission date will receive a mark of 0%. These regulations apply to a student’s first attempt at coursework. Work submitted late without authorisation which constitutes reassessment of a previously failed piece of coursework will always receive a mark of 0%.”* | | | | | | |
| **Academic Offences and Bad Academic Practices:**  **These include plagiarism, cheating, collusion, copying work and reuse of your own work, poor referencing or the passing off of somebody else's ideas as your own. If you are in any doubt about what constitutes an academic offence or bad academic practice you must check with your tutor. Further information and details of how DSU can support you, if needed, is available at:**  <http://www.dmu.ac.uk/dmu-students/the-student-gateway/academic-support-office/academic-offences.aspx> and  <http://www.dmu.ac.uk/dmu-students/the-student-gateway/academic-support-office/bad-academic-practice.aspx> | | | | | | |
| **Tasks to be undertaken:** Details in Section A of this document. | | | | | | |
| **Deliverables to be submitted for assessment:** Details in Section B of this document. | | | | | | |
| How the work will be marked: Details in Section C of this document. | | | | | | |
| **Module leader/tutor name:** | | **Dr Hossein Malekmohamadi** | | | | |
| **Contact details:** | | **Hossein.malekmohamadi@dmu.ac.uk** | | | | |

1. **Tasks to be undertaken:**

The purpose of this coursework is to create a shader program capable of rendering the Utah teapot with ambient, diffuse and specular lighting.

A lighting modelcalculates the shade and colour of a point on a surface of a model by the light sources around it. Phong shading is calculated by combining different forms of light to create the overall lighting for a model. This light is calculated by combining ambient, diffuse and specular. Ambient light represents light which bounces around and is always there. Diffuse uses directional light to describe which parts of the model should be brighter and which points should be darker. Finally, specular light effects the shininess of the model.

Students are expected to modify the per pixel diffuse shader code to produce a program that displays a 3D teapot using full per pixel ambient/diffuse/specular lighting. The current code includes only diffuse lighting. Students can set ambient and specular lights to (0.3, 0.3, 0.3). For the plane material, you can set Ka to (0.51, 1, 0.49) and Ks to (0.1, 0.1, 0.1). For the teapot material, you can set Ka to (0.46,0.29, 0) and Ks to (0.29, 0.29, 0.29). Students have to use different shininess and attenuation factors to see their effects. Students are required to use structures and functions for this coursework in their shader codes.

1. **Deliverables to be submitted for assessment:**

1. A Visual Studio 2017 C++ Project Solution for your program. This should be well commented and packaged with all necessary third party includes/libraries so it can be transferred to another computer and be compiled and run without Project Property reconfiguration and without warning or error. Your code should be shared via a Github link.

2. A well-structured and referenced written report uploaded in to Turnitin, provided as an MS-Word file, including:

* A statement of the report’s purpose
* An illustrated explanation of the theoretical principle full Phong shading
* An annotated explanation of the sections of program code specifically needed to produce full Phong Shading including the structures and the functions
* Output screen captures showing different effects of attenuation factors, shininess factor, light intensity and material types on the final result. This should have a proper discussion and justification.
* A conclusion and reference list which is used in the main report

1. A Turnitin check on your final report document
2. **How the work will be marked:** Your work will be marked according to:

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| Description | 0-29% | 30-39% | 40-49% | 50-59% | 60-69% | 70-100% |
| If the code can run any lab PC and produce the results (50) | No code submission | It contains only diffuse lighting (default setting). No attempt to implement Phong shading. | Some attempts made to run the full Phong shading with no annotations and no functions/structures. One of the lighting elements is missing or not functioning. | Reasonable programming and annotations with some functions and structures. Most Phong elements are working. | Good programming and annotations are observed with the use of functions and structures. All Phong elements are working. | Very good programming and annotations are observed with reference to the report and vice versa. Clear use of structures and functions is observed. All Phong elements are working. User can increase/decrease controlling parameters. |
| An illustrated explanation of the theoretical principle of full Phong shading (20) | No explanation is given | Inadequate explanation is given. It is not illustrated. The theoretical principles of Phong shading have not been address correctly. | Some illustrated explanations of Phong shading are observed. They lack integrity or referencing. | Moderate explanation of Phong shading. Some parts are missing or misinterpreted. | Good structure and fluid. Well referenced and visualised. | Exceptional effort to show how theory of Phong shading works and how to address some of its challenges in modern computer graphics. Some examples are given in modern games. |
| An account of how distance, material type and shininess factors can affect the full Phong shading results (20) | No discussion is given | Inadequate discussion is given for affecting factors in Phong shading. | Some explanations on how these parameters affect Phong shading in both visualisation or references. | Moderate explanation is given. It is somehow short and not visualised. It is referenced. | Good story is told. Visualisation and referencing are used. It lacks in technical justification and discussion. | Very good explanation, visualised and referenced. An excellent explanation is given to compare different parameter effects on the Phong shading. Some examples are given in modern games. |
| Report structure and fluidity (10) | No report submitted | Report does not demonstrate Phong shading and has many missing sections | One or two of the statement of purpose, body or referencing are missing. | Moderate report with statement of purpose, body and referencing however is not well-structured. Figures or tables are not properly captioned or missing. | Good report considering all elements and fluidity with proper referencing. Good use of figures and tables if necessary. | Exceptional report with quality as a showcase for future students. Exceptional effort on report, structure, references and content. Very good use of visualisation tools. Very clear take-home message is observed for student employability skills. |