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| **Subject Code and Title of New Course** | **Code: FE8828**  **Title: Programming Web Applications in Finance** | |
| **Details of Subject** | **Rationale for introducing this subject**  This course teaches how to build web-based applications for finance. Students will learn how to create interactive reports and dashboard, interactive rich data visualization in browser. Students will also learn about how internet works, how to create a website with cloud computing infrastructure like Amazon Web Services. Students will also study about the latest technology for internet, the cryptocurrency and payment system, Bitcoin and Blockchain.  The course will advance the knowledge and skills towards building real-world application for the internet. Web-based application is easily accessible worldwide only with a browser and there are powerful libraries to display financial data in browser. This skill is of very high practical value to the students because they can turn their knowledge to applications quickly and more ready for a career in finance. Spreadsheet running on desktop is not the working model for the future due to its “offline” nature and lack of tools; the now and future are all about web-based applications. | |
| **Aims and objectives**   * Students are able to pick up new programming languages quickly, new programming paradigm (reactive, object-oriented) quickly, new functional libraries quickly. * Students are able to tackle problem solving in large and small scales, i.e., understanding the structure of web/browser and make use of it.   Students are able to independently and confidently complete computing projects. | |
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| **Syllabus**  **Lecture 1 and 2**: Foundation   1. What’s Web and what’s Internet?    1. TCP/IP protocol: where IP address, network protocols, DNS    2. HTTP(S) protocols    3. URL 2. Languages    1. HTML/CSS    2. JavaScript    3. Markdown: the language for static and interactive documents.    4. R refresh 3. Development Tools 4. Amazon Web Services:    1. How to setup S3 for storage, EC2 for virtual machine, Route 53 for DNS.   Reading: TBC  Assignment:   * Setup a website with AWS. * Write a markdown document and publish it website. * Use JavaScript to manipulate web page parts   **Lecture 3 and 4**: Applications (already running on AWS)   1. R Programming    1. Interactive Web-based R application with Shiny framework    2. Dashboard with Flexdashboard/htmlwidget in R 2. JavaScript    1. Node.JS development framework    2. React.JS application framework    3. Full-stack Web application development with React.JS framework   Reading and self-study:   * Video lecture on Shiny/React.JS on YouTube.   Assignment:   * Write a new map-based interactive application * Write a bond pricing program * Algorithm trading analysis | |
| **Lecture 5 and 6**: Extension Layer: Bitcoin and Blockchain   1. Bitcoin as an invention of many ideas    1. Mining    2. Blockchain data structure    3. Consensus algorithm 2. Case studies    1. “Genesis” Nakamoto, Satoshi (24 May 2009). "Bitcoin: A Peer-to-Peer Electronic Cash System"    2. Smart Contract  * <https://medium.com/@ConsenSys/a-101-noob-intro-to-programming-smart-contracts-on-ethereum-695d15c1dab4#.rahuuy8uh> * <https://bitsonblocks.net/2016/02/01/a-gentle-introduction-to-smart-contracts/>   1. Practical      1. Hard fork of Ethereum after a hacker stole tens of millions of dollars worth of digital currency.      2. Bank of England: Staff Working Paper No. 605: The macroeconomics of central bank issued digital currencies - John Barrdear and Michael Kumhof      3. Bitcoin Energy Consumption: <http://digiconomist.net/beci>   Reading: the papers listed in case studies.  Assignment:   * Do experiment with etherum for private blockchain * Write a smart contract | |
| **Assessment**  **(if it is non-examinable, please provide justification/rationale.**  **For non-examinable courses, the individual component must make up at least 70% of the total assessment.)** | **Component Assessment-Based**  Class Participation Individual  Quizzes Individual  Project Group  Other Assignments Individual  *School would undertake and ensure that a framework is in place that would properly and fairly assess the individual and group performance of the students for the course. The framework and the assessment marks (individual and group) are to be clearly administered and documented for auditing purposes when called upon.* | 10%  25%  30%  35% |
|  | **Total** | **100%** |
| **Hours of Contact/Academic Units** | 21 hours (1.5 AUs) | |

**Justification for non-examinable course**

FE8828 *Programming Web Applications in Finance* will heavily use Amazon Web Services (AWS), a popular cloud computing platform, to conduct lessons. Students will learn about how the internet works, and the key software languages used in web application development. They will also learn to setup a website, publish data, and develop various interactive applications in finance. All the class sessions for the course will be taught in a computer lab. Students are expected to access the internet to do analyses, assignments and projects.

Through the cloud computing platform, the course hopes to achieve the following learning objectives where participants will know:

1. the theoretical underpinnings of the internet and cloud-based quantitative analyses used in investments and risk management;
2. how to find data and develop cloud computing tools to conduct rich and cost-effective quantitative analyses; and
3. how to analyze data and information to optimize investment portfolios and perform risk management.

In view of this new pedagogical format, we would thus like to remove the final exam component for this course. In lieu of the final exam, students will be given a final test where they will be required to develop cloud-based software tools to download, analyze, and display data.