3.2.12 Bachelor of Science in Business Analytics

Objective

The emerging phenomena of Big Data – large pools of data sets that can be captured, communicated, aggregated, stored, and analyzed – has presented companies and organisations with trillions of bytes of information about their customers, suppliers, and operations. Millions of networked sensors are also embedded in various devices such as mobile phones and tablet computers to sense, create, and communicate data. Big data is now part of every industry sector and function of the global economy. It is increasingly the case that modern economic activity, innovation, and growth have to take place with data and the related analytic processes, methods and outputs. The discipline of business analytics (BA) enables companies and organisations to realise the full potential of data generated from various business processes, sources and devices, thus improving their speed and effectiveness in generating business insights and intelligence for optimal decision making purposes.

Programme Introduction

The Bachelor of Science (Business Analytics) degree programme is an inter-disciplinary undergraduate degree programme offered by the School of Computing with participation from the Business School, Faculty of Engineering, Faculty of Science, and Faculty of Arts and Social Sciences. This is a four-year direct honours programme which offers a common two-year broad-based inter-disciplinary curriculum where all students will read modules in Mathematics, Statistics, Economics, Accounting, Marketing, Decision Science, Industrial and Systems Engineering, Computer Science and Information Systems. Students in their third and fourth years of study may choose elective modules from two lists of either functional or methodological elective modules. Functional elective modules span business functions or sectors of marketing, retailing, logistics, healthcare, etc. Methodological elective modules include those related to big data techniques, statistics, text mining, data mining, social network analysis, econometrics, forecasting, operations research, etc. In sum, these elective modules span the most exciting and challenging areas of business analytics practice in the industry today.

Programme Learning Objectives

Learning objectives of the Bachelor of Science (Business Analytics) degree programme are:

- To understand the conceptual and methodological foundations of analytical methods and techniques for business analytics, as referenced from disciplines such as computing, engineering, science, mathematics, statistics, business and economics
- To appreciate and understand current business analytics problems in the industry worldwide and be able to identify and resolve practically relevant business analytics questions and issues
- To apply appropriate analytic tools and techniques to resolve complex business analytics problems in various industry sectors and domains
- To cultivate the practices of independent and group learning on the part of students that will prepare them to function effectively for diverse careers in business analytics
Students with CAP of 4.00 or higher may opt to replace IS4010 Industry Internship Programme by BT4101 B.Sc. Dissertation. Students who aim for Honours (Highest Distinction) must pass the BT4101. Students with CAP of 4.00 or higher after completing at least 70% (i.e. 112 MCs) of the MC requirement for the degree programme may opt to replace the IS4010 Industry Internship Programme by BT4101 (12 MCs).

Students under the NUS co-operative education programme will need to take BT4011 Business Analytics Capstone Industry Project rather than BT4101. Note that the BT4101 project selection process takes place one semester ahead of the semester in which the students commence BT4101. Thus the students can tentatively select BT4101 projects; but the condition “CAP of 4.00 or higher after completing at least 70% (112 MCs) of the MC requirement for the degree programme” must be satisfied before they can commence BT4101 in lieu of IS4010.

NUS Overseas Colleges (NOC) - Business Analytics

Students who attended NOC programme may:

1. count TR3201 Entrepreneurship Practicum (8 MCs) partially in lieu BT4101 BSc Dissertation (4 out of 12 MCs) and replace one Business Analytics programme elective at level-3000 (4 MCs).
2. count TR3202 Start-up Internship Programme (12 MCs) towards Industrial Experience Requirement (i.e. IS4010 Industry Internship Programme).
3. count TR3203 Start-up Case Study and Analysis (8 MCs) partially in lieu of BT4101 BSc Dissertation (8 out of 12 MCs).

University Scholars Programme (Business Analytics)

Students in the University Scholars Programme (USP) who choose the Bachelor of Science (Business Analytics) degree programme will do so with the following variations:

1. They will not be required to read IS2101 Business and Technical Communication in the Core modules requirement. It is replaced by USP Foundation module of Writing and Critical Thinking.
2. They will read the UROP modules (CP3208 and CP3209) in place of the Business Analytics Capstone Project module (BT4103) in the Core modules requirement. CP3208 and CP3209 are independent study modules (ISM) which will be counted as 2 USP Inquiry modules in the Sciences and Technologies domain.
3. They will read GER1000 Quantitative Reasoning (4 MCs) as compulsory module for the University Level Requirements (ULR). The remaining 16 MCs in ULR are replaced by the 3 USP Inquiry Modules and 1 USP Foundation module (i.e. University Scholars Seminar).
4. They will not be required to read Unrestricted Electives (20 MCs). These are replaced by the USP Reflection module of Senior Seminar and 4 USP Inquiry modules.
5. In summary, the breakdown of 12 USP modules will fit into these MCs requirement categories:
   - Core: 1 Foundation module (Writing and Critical Thinking replacing IS2101), 2 Inquiry module (CP3208 & CP3209/USP-ISM replacing BT4103)
   - ULR: 3 Inquiry modules and 2 Foundation modules
   - UE: 1 Reflection module and 3 Inquiry modules
<table>
<thead>
<tr>
<th>MODULES</th>
<th>MCS</th>
<th>SUB TOTALS</th>
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<tbody>
<tr>
<td>UNIVERSITY LEVEL REQUIREMENTS</td>
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<td>20</td>
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<td>Please refer to Section 3.2.1.</td>
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<td>PROGRAMME REQUIREMENTS</td>
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<td>108</td>
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<tr>
<td>Core Modules</td>
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<tr>
<td>BT1101  Introduction to Business Analytics</td>
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<td>CS1010S  Programming Methodology</td>
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<td>EC1301  Principles of Economics</td>
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<tr>
<td>IS1103/X  IS Innovations in Organisations and Society</td>
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<tr>
<td>MA1311  Matrix Algebra and Applications, or MA1101R Linear Algebra I</td>
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<td>MA1521  Calculus for Computing, or MA1102R Calculus</td>
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<td>MKT1705X Principles of Marketing</td>
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<td>BT2101  Decision Making Methods and Tools</td>
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<td>BT2102  Data Management and Visualisation</td>
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<td>CS2030  Programming Methodology I</td>
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<td>CS2040  Data Structures and Algorithms</td>
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<tr>
<td>IS2101  Business and Technical Communication</td>
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<td>ST2334  Probability and Statistics</td>
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<td>BT3102  Computational Methods for Business Analytics</td>
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<td>BT3103  Application Systems Development for Business Analytics</td>
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<td>IS3103  Information Systems Leadership and Communication</td>
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<td>BT4103  Business Analytics Capstone Project</td>
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<td>Programme Electives (PE)</td>
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Option 1:
Choose 6 modules to make up 24 MCs from Lists A, B and C, with at least 2 modules each from Lists A and B. 5 of 6 modules must be at level-4000.

List A (Functional):
DBA3712 Dynamic Pricing and Revenue Management
IE3120 Manufacturing Logistics
IS3240 Digital Platform Strategy and Architecture
BT4013 Analytics for Capital Market Trading and Investment
BT4016 Risk Analytics for Financial Services
BT4211 Data-Driven Marketing
BT4212 Search Engine Optimization and Analytics
DBA4811 Analytical Tools for Consulting
IS4241 Social Media Network Analysis
IS4250 Healthcare Analytics
MKT4812 Marketing Analytics

List B (Analytics Methods):
IE2110 Operations Research I, or DBA3701 Introduction To Optimisation
CS3244 Machine Learning
DBA3803 Predictive Analytics in Business
BSE4711 Econometrics for Business II
BT4012 Fraud Analytics
BT4015 Geospatial Analytics
BT4221 Big Data Techniques and Technologies
BT4222 Mining Web Data for Business Insights
BT4240 Machine Learning for Predictive Data Analytics
IS4241 Social Media Network Analysis
IE4210 Operations Research II
ST3131 Regression Analysis

List C (Technology Implementation):
IS3221 Enterprise Resource Planning Systems
IS3261 Mobile Solutions Design and Development
BT4014 Analytics Driven Design of Adaptive Systems
IS4228 Information Technologies in Financial Services
IS4302 Blockchain and Distributed Ledger Technologies

Specialisations:
To be awarded the Financial Analytics Specialisation, students must satisfy the followings:

Compulsory modules (do all 3 modules):
• BT4013 Analytics for Capital Market Trading and Investment
• BT4016 Risk Analytics for Financial Services
• IS4228 Information Technologies in Financial Services

Elective modules (select any 3 modules):
• BT4012 Fraud Analytics
• BT4221 Big Data Techniques and Technologies
• BT4222 Mining Web Data for Business Insights
• IS4234 Quality Control and Audit of IS
• IS4302 Blockchain and Distributed Ledger Technologies

To be awarded the Marketing Analytics Specialisation, students must satisfy the followings:

Compulsory modules (do all 3 modules):
• BT4211 Data-Driven Marketing
• BT4212 Search Engine Optimization and Analytics
• BT4222 Mining Web Data for Business Insights

Elective modules (select any 3 modules):
• BT4014 Analytics Driven Design of Adaptive Systems
• BT4015 Geospatial Analytics
• BT4221 Big Data Techniques and Technologies
• IS3249 Economics of E-Business
• IS4241 Social Media Network Analysis
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<td>BT4101 BSc Dissertation or IS4010 Industry Internship Programme</td>
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<td>UNRESTRICTED ELECTIVES</td>
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<td>Grand Total</td>
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1. Students have done EC1101E Introduction to Economic Analysis can use it to replace EC1301.

2. Students are encouraged to take these MA module options should they wish to pursue a more rigorous treatment of the subject topics covered.

3. For students taking Second Major in Statistics, they can replace ST2334 with ST2131 to meet first major requirement. For students taking the Second Major in Mathematics, they can replace ST2334 with both ST2131 and ST2132 to meet first major requirement. The MCs for ST2132 come from Unrestricted Electives. For students taking the minor in Mathematics, they can replace ST2334 with ST2131 and take ST2132 as an unrestricted elective to meet first major requirement.

4. Students are encouraged to take IE2110 should they wish to choose IE4210 as an elective module.

5. Students who are doing or contemplating to do minor/second major requiring ST3131 such as Statistics which has more than allowed overlap cannot double count ST3131 towards fulfilling the BSc (BA) programme elective requirement.

6. Students can choose to take on any current 12 MCs or more internship-related programmes within the School of Computing (e.g., CP3880 Advanced Technology Attachment Programme (ATAP)) and/or within NUS (e.g., Innovative Local Enterprise Achiever Development (iLEAD) and NUS Overseas College (NOC)) in place of IS4010 Industry Internship Programme to satisfy the industry experience requirement.