PROPOSAL FOR A

BACHELOR OF SCIENCE IN DATA ANALYTICS/ECONOMICS

Sponsored by:

Department of Social Science

School of Arts and Sciences

New York City College of Technology

City University of New York

Anticipated initiation: Spring 2020

Governance Approval Date: TBD

Contact persons:

Provost Dr. Bonne August: [BAugust@citytech.cuny.edu](mailto:BAugust@citytech.cuny.edu)

Associate Provost Dr. Pamela Brown: [PBrown@citytech.cuny.edu](mailto:PBrown@citytech.cuny.edu)

Dean Dr. Justin Vazquez-Poritz: [JVazquez-Poritz@citytech.cuny.edu](mailto:JVazquez-Poritz@citytech.cuny.edu)

Dr. Gulgun Bayaz-Ozturk [GbayazOzturk@citytechcuny.edu](mailto:GbayazOzturk@citytechcuny.edu)

Dr. Randall Hannum [Rhannum@citytech.cuny.edu](mailto:Rhannum@citytech.cuny.edu)

Dr. Sean P. MacDonald [smacdonald@citytech.cuny.edu](mailto:smacdonald@citytech.cuny.edu)

Dr. Unurjargal Nyambuu [Unyambuu@citytech.cuny.edu](mailto:Unyambuu@citytech.cuny.edu)

Dr. Peter Parides (Dept. chair) [Pparides@citytech.cuny.edu](mailto:Pparides@citytech.cuny.edu)

PROGRAM IDENTIFICATION

COLLEGE New York City College of Technology

of The City University of New York

PROGRAM TITLE Data Analytics/Economics

DEGREE Bachelor of Science

Dr. Bonne August

Provost and Vice President of Academic Affairs

New York City College of Technology

BAugust@citytech.cuny.edu

Dr. Pamela Brown

Associate Provost

New York City College of Technology

[PBrown@citytech.cuny.edu](mailto:PBrown@citytech.cuny.edu)

Dr. Justin Vazquez-Poritz Dean, School of Arts and Sciences

New York City College of Technology

JVazquez-Poritz@citytech.cuny.edu

PROPOSED INITIATION Spring 2020

Table of Contents

CURRICULUM MODIFICATION PROPOSAL FORM 5

1. Program Purpose and Goals 8

2. Need and Justification 10

2.1 Labor Market Analysis 11

2.2 Employment Opportunities 12

2.3 Data Analyst Salary 16

2.4 Internships in Data Analytics and Applied Social Science 17

3. Student Interest and Enrollment 21

3.1 Student Interest 21

3.2 Projected Enrollment 24

4. Other Programs 24

4.1 Other Programs at CUNY 24

4.2 Data Analytics Programs at Other Universities and Student Enrollment 26

5. Curriculum 29

5.1 Overview of the courses in the Curriculum 29

5.2 Anticipated Learning Outcomes in the Curriculum 30

5.3 Courses Required to Complete the Program 31

5.4 Sample four-year course program 33

5.5 Mapping Anticipated Learning Outcomes to the Courses 36

5.6 Catalog Description of New Economics Courses 38

5.6.1 ECON 2201 Introductory Econometrics 38

5.6.2 ECON 3201 Advanced Topics in Econometrics 38

5.6.3 ECON 3801 Introduction to Statistical Learning 39

5.6.4 ECON 2401 Intermediate Microeconomics 39

5.6.5 ECON 2101 Intermediate Macroeconomics 39

5.6.6 ECON 3401 Applied Microeconomics 39

5.6.7 ECON 3101 Applied Macroeconomics 40

5.6.8 ECON 3301 Visualizing and Mapping Economic Data 40

5.6.9 ECON 4201 Internship/Research Project 40

6. Faculty 40

6.1 Faculty names and areas of specialization (in alphabetical order) 40

6.2 Faculty expertise needed 41

7. Cost Assessment 41

8. Computer/lab needs 42

Appendix A: Economics Discipline Meeting Minutes 42

Appendix B: Letters of Support 45

B.1 Letters of Support from Industry 46

B.2 Letters of Support from Graduate Programs in the NYC Area 47

B.3 Letters of Support from Departments at City Tech 49

B.4 Evidence of Consultation with Affected Departments: Computer Systems Technology and Mathematics 50

Appendix C -- Library Form 55

Appendix D -- New Course Proposals 56

D.1 ECON 2201 Introductory Econometrics 57

D.2 ECON 3201 Advanced Topics in Econometrics 78

D.3 ECON 3801 Introduction to Statistical Learning 98

D.4 ECON 2401 Intermediate Microeconomics 119

D.5 ECON 2101 Intermediate Macroeconomics 140

D.6 ECON 3401 Applied Microeconomics 161

D.7 ECON 3101 Applied Macroeconomics 189

D.8 ECON 3301Visualizing and Mapping Economic Data 211

D.9 ECON 4201 Internship/Research Project 230

Appendix E – Program Admission Requirements 244

Appendix F -- A List of Data Analytics and Data Science Programs 245

New York City College of Technology, CUNY

# CURRICULUM MODIFICATION PROPOSAL FORM

This form is used for all curriculum modification proposals. See the [Proposal Classification Chart](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Proposal_Classification_Chart.pdf) for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.

|  |  |
| --- | --- |
| **Title of Proposal** | Bachelor of Science in Data Analytics/Economics |
| **Date** | August 23, 2018 |
| **Major or Minor** | Major |
| **Proposer’s Name** | Gulgun Bayaz-Ozturk  Randall Hannum  Sean P MacDonald  Unurjargal Nyambuu |
| **Department** | Social Science |
| **Date of Departmental Meeting in which proposal was approved** | November 1, 2018 |
| **Department Chair Name** | Peter Parides |
| **Department Chair Signature and Date** | signature-1.5.jpg10/24/18 |
| **Academic Dean Name** | Justin Vazquez-Poritz |
| **Academic Dean Signature and Date** | Picture 11/27/19 |
| **Brief Description of Proposal**  (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body. | The Department of Social Science of the School of Arts and Sciences proposes a Bachelor of Science degree in Data Analytics/Economics. Data analytics is an applied field of study which is in strong demand and in which an expertise in the field of Economics is sought across many industries. There is currently no equivalent bachelor’s level program within CUNY. |
| **Brief Rationale for Proposal**  (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body). | * A strong labor market picture, rapidly growing enrollment trends at colleges and universities nationally in recently developed data analytics degree programs, together with a wide range of internship programs and opportunities offer strong evidence that the field of data analytics with an application in Economics is one that offers an excellent opportunity as a field of study for our students. * The skills attained through this proposed program will prepare students for entry-level positions across a number of industries and occupations, including health, finance, public policy, real estate, environmental analysis, digital media, research and development, industrial organization, behavioral economics, and corporate finance. * The program will also prepare students who choose to enter a masters’ level program, such as the Master of Science program in data analytics at the CUNY School of Professional Studies and the Master of Arts in Data Analytics and Applied Social Research at Queens College. * Based upon several recent studies and the Bureau of Labor Statistics *Occupational Outlook*, jobs in data analytics are in high demand and will continue to grow as the volume of data rapidly expands. |
| **Proposal History**  (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list). | This is a first submission |

Please include all appropriate documentation as indicated in the Curriculum Modification Checklist.

For each new course, please also complete the New Course Proposal and submit in this document.

Please submit this document as a single .doc or .rtf format. If some documents are unable to be converted to .doc, then please provide all documents archived into a single .zip file.

**ALL PROPOSAL CHECK LIST**

|  |  |
| --- | --- |
| Completed CURRICULUM MODIFICATION FORM including: |  |
| * Brief description of proposal | X |
| * Rationale for proposal | X |
| * Date of department meeting approving the modification | X |
| * Chair’s Signature | X |
| * Dean’s Signature | X |
| Evidence of consultation with affected departments  List of the programs that use this course as required or elective, and courses that use this as a prerequisite. | X |
| Documentation of Advisory Commission views (if applicable). | N/A |
| Completed [Chancellor’s Report Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Chancellor_Report_Quick_Reference_Guide1.doc). | X |

**EXISTING PROGRAM MODIFICATION PROPOSALS**

|  |  |
| --- | --- |
| Documentation indicating core curriculum requirements have been met for new programs/options or program changes. |  |
| Detailed rationale for each modification (this includes minor modifications) | X |

# 1. Program Purpose and Goals

The Social Science Department (Economics) at the New York City College of Technology (City Tech) is proposing a Bachelor of Science degree in Data Analytics with an applied focus in Economics. This program would include core applied courses in Economics, Mathematics and Computer Systems Technology. Within CUNY, while there is an undergraduate bachelor’s level program as well as an MS program at Baruch College, the proposed new program at City Tech would be unique in its focus. The program at Baruch College offers a data analytics track in its Computer Information Systems bachelor of science degree program. While this track includes 12 elective credits in operations research and marketing with business applications in addition to the core courses in programming, data mining and data warehousing[[1]](#footnote-1), there is no set of core course requirements in an applied discipline.

The introductory and the proposed intermediate courses in macroeconomics and microeconomics will provide the fundamental economic concepts and theoretical foundation. The applied intermediate level courses in two main branches of economics covering topics in various subdisciplines such as health, environmental, behavioral, managerial economics, international trade and finance, and industrial organization will provide a grounding in the applied focus. These courses will provide students with the skills needed to think critically and to understand and clearly communicate increasingly more complex and advanced economic concepts and theory based on applications to real-world economic problems. At the same time, the required sequence of courses in mathematics including calculus I and II and statistics with probability will enable students to develop and sharpen their skills in quantitative analysis, providing the foundation for more complex problem-solving skills needed for the math methods for Economics and introductory econometrics courses.

Further, a computational foundation (computer knowledge) for technical skills, including data mining – downloading and examining large datasets – is an essential skill particularly recommended for students to successfully complete advanced Economics courses such as econometrics. CST 2402, a new *data science* course, is essential for the Data Analytics major as it addresses issues related to Big Data techniques and tools, machine learning, data mining and data visualization using Python tools. Computer systems courses provide fundamental skills in data downloading from online sources, writing language, and programming. In addition, courses in *introduction to computer systems* - which provides an overview of machine architecture, software development, data organization, ethics, computer security, and algorithms, in *database systems fundamentals* – which introduces students to relational databases and SQL, students learn how to create tables, specify constraints, populate tables with data, and manipulate data, in *computer programming and problem solving* – which introduces concepts of problem solving using constructs of logic inherent in computer programming languages, and *programming fundamentals* – which introduces computer programming using the Java language including control structures and user-defined methods. Students also gain experience using RapidMiner, Tableau and other data analytics and visualization tools. All of these skills will provide grounding in key skills required to successfully work with and analyze data in applied economics fields including health, finance, industrial organization, management, and public finance.

Finally, the Data Analytics degree program would require students to participate in a semester long internship. Preliminary research indicates that there are numerous internship opportunities for undergraduates nearing completion of their studies. The types of internships available found that firms in real estate, health care, banking and finance, government, and research and development currently seek interns in data analytics. Students pursuing a degree in statistics, economics, finance, mathematics, or business were ranked among those in strong demand. Integrating data science in their education will boost their career.

As an increasing volume of data across nearly every industry is collected, digitized and stored, the demand for graduates with applied data analytics training has grown rapidly. A recent report based on a study conducted by Wanted Analytics indicated that jobs requiring big data skills had, on average nationwide, 13 applicants per opening.[[2]](#footnote-2) This suggests that such jobs could still be somewhat difficult to fill, as specific applied training and other position-specific requirements may vary from one opening to the next. The report also noted that the New York metropolitan area ranks among the top three big data employment markets nationwide.[[3]](#footnote-3) This employment trend clearly points to this rapidly growing field as one that offers valuable potential and that will continue to experience strong demand for workers with the needed skills throughout a wide range of industries.

According to the U.S. Bureau of Labor Statistics, there are many occupations that are involved in big data analysis and the job titles of these workers are evolving. Thus, while the BLS does not collect data specifically on data analysts, it may classify them as statisticians, market research analysts and more broadly in mathematics and computer related occupations.[[4]](#footnote-4) The BLS occupational projections for 2014 through 2024 indicate that math and computer related occupations are expected to grow by 13 percent with median annual earnings of $87,800 in 2016.[[5]](#footnote-5) In New York State, these occupations were projected to increase by 3.6 percent between 2016 and 2018, with 8,040 annual average openings over this two-year period. Statewide median annual earnings were estimated at $85,480.[[6]](#footnote-6) In the New York City metropolitan area, the same occupations were projected to grow by 4.3 percent between 2013 and 2015 (the most recent projections available) with an estimated 4,580 annual average openings, with annual average earnings of $89,080.[[7]](#footnote-7)

# 2. Need and Justification

A Data Analytics degree program at the New York City College of Technology would have broad appeal and would offer many promising job opportunities for our students. It would also have a valuable role in addressing the growing demand for workers with an applied data analytics degree, while contributing to the kind of applied research and projects that our students are increasingly engaged in. An applied data analytics degree program would also be a natural fit at the New York City College of Technology, which has recently implemented new applied Bachelor of Science degree programs within the College of Arts and Sciences, including Applied Computational Physics and Applied Chemistry. Further, this program has strong interdisciplinary potential, as the skills and applied focus of the degree could have applications across the Behavioral and Social sciences and other disciplines.

A four-year degree program at City Tech would offer further training for graduates of CUNY two-year AS degree programs, including those at the Borough of Manhattan Community College, Bronx Community College, and Kingsborough Community College. An applied four-year degree program in data analytics at City Tech as proposed here would also provide excellent preparation for students planning to enter a graduate program in data analytics, such as the Master of Science program in data analytics at the CUNY School of Professional Studies and Master of Arts in Data Analytics and Applied Social Research at Queens College.

A strong labor market picture, growing enrollment trends at colleges and universities nationally in recently developed data analytics degree programs, together with a wide range of internship programs and opportunities offer strong evidence that the field of data analytics with an application in Economics is one that offers an excellent opportunity as a field of study for our students. The skills attained through this proposed program will prepare students for positions across a number of industries and occupations, including health, finance, public policy, real estate, environmental analysis, digital media, research and development, industrial organization, behavioral economics, and corporate finance.

## 2.1 Labor Market Analysis

The field of data analytics is an applied field of study requiring expertise and/or an undergraduate degree in any of a number of disciplines including Economics, Sociology, Statistics, Math, Computer Science, Information Systems, Public Policy, Urban Planning, and Political Science. This broad range of disciplinary applications of the training and skills acquired in a data science program point to its wide interdisciplinary appeal. A 2013 study conducted by the U.S. Bureau of Labor Statistics entitled “Working with Big Data” provided a detailed overview of the kind of occupations involved with using big data, as well as some challenges that the work can present. The study defined big data as “a collection of large datasets that cannot be analyzed with normal statistical methods.” These are datasets that are extremely large, measured in ‘exabytes’ (quintillions). They are not limited to numerical data, but may also include videos, pictures, maps, and phrases, among other types of information including bank records, electronic medical records, and comments on social networking sites.

A Data Analytics degree program at the New York City College of Technology would have broad appeal. While this labor market study is focused on its applications in Economics, the field is one that encompasses disciplines across the sciences, the social sciences and applied technology disciplines. Such a program has the potential to enhance the kind of applied research and projects that our students are increasingly engaged in. At the same time, it offers very strong job prospects for undergraduates.

Among those who work with big datasets are **computer systems and database administrators;** **software developers**; **Economists;** **researchers**; **physicists**; **biologists**, **mathematicians**; **data analysts** of social networking sites; **telecommunications analysts**; **political analysts**; **social scientists;** occupations that employ **geographic information systems**, maintain and monitor electronic medical records; other data scientists. Big Data specialists work in virtually every major industry. The same study cited one of the greatest barriers to the “widespread use of big data is the ***lack of workers with the appropriate training and skills.[[8]](#footnote-8)”***

This trend clearly points to this new field as one that offers valuable potential and as one that is and will continue to experience strong demand for workers with the needed skills throughout a wide range of industries and occupations. The following presents the findings on college/university programs that currently offer a Bachelor’s degree in Data Science, Internship placements, job placements and opportunities, internship opportunities, and a broad outline of how a Data Science 4-year degree program might include.

## 2.2 Employment Opportunities

There are growing opportunities, including both full time jobs and undergraduate internships, in the field of *Big Data Science*, especially when combined with *Social Science Research*. Some of these jobs, e.g., the new title of *Data Scientist*, require practitioners to determine “the link between research investments and innovation;” as described in the book *Big Data and Social Science: A Practical Guide to Methods and Tools* (Foster et al. 2016), “social scientists have been addressing using big data techniques”.[[9]](#footnote-9)

Surveys indicate that Data Analytics has become one of the most sought-after internship positions and demand is increasing. This is shown in surveys, e.g., the *[2016 Harvey Nash/KPMG CIO Survey](https://home.kpmg.com/xx/en/home/insights/2016/05/harvey-nash-kpmg-cio-survey-2016.html)*, where an increase in demand for skilled professionals in Big Data is highlighted. We see that “data analysis remains (the) most in-demand skill for (the) second year in a row.” The survey specifically posed the question: “which functions do you feel suffer from a skills shortage?” Dr. Jonathan Mitchell stated that “nearly 40 per cent of IT leaders tell us that they suffer from skills shortfalls in this area. We think that big data and digital are closely entwined. As organizations increasingly use digital platforms to reach their customers in new ways, data volumes are rising at a spectacular pace. We think that those who understand what they need to collect and what they should do with this data are going to be the big winners in the years ahead” ([2016 Harvey Nash/KPMG CIO Survey](https://home.kpmg.com/xx/en/home/insights/2016/05/harvey-nash-kpmg-cio-survey-2016.html), page 7).

**Full Time Positions in Data Analytics**

Full time jobs, as well as internships, in *Applied Data Science*, *Data Science, Survey Science, and Data Research* are frequently listed on many websites including the job search engines, e.g., Indeed, CareerBuilder, Burning-glass, etc.; school job search site, e.g., [FutureLink](http://asccareerservices.osu.edu/futurelink/student), and company websites, e.g., CIVIS Analytics, are also good sources.[[10]](#footnote-10)

Companies may also offer full time jobs to students with Bachelor’s degrees in a wide variety of areas including economics, sociology, political science or other social science fields. For example, “New Graduate – Social Scientist” or “Social Science Analyst” positions are posted at CIVIS Analytics.[[11]](#footnote-11) Summary information about this position is shown in *Table 1* and the full ad is shown in *Appendix 4*. Other companies are also hiring Data Analysts in specific areas, e.g., Economics, Environmental Studies, and Healthcare (see *Table 1* for details).

**Table 1: Full Time positions in Data Scientist and Social Science/Economics**

|  |  |  |  |
| --- | --- | --- | --- |
| **Job Title** | **Requirement in Degree/Major** | **Job Description/ Big Data Component** | **Employer** |
| Junior Data Scientist – Economist | **Bachelor’s degree in economics**, applied mathematics, or statistics, computer science, including some training in microeconomics, econometrics, statistics, advanced mathematics. | Work on research projects applying data science, data engineering and econometric skills to policy questions which incorporate Behavioral Economics, Public Economics, Education, Health and Industrial Organization | The Rhode Island Innovative Policy Lab (RIIPL) |
| New Graduate – Social Scientist (social science analyst) (full time) | Bachelor’s degree in survey methods, statistics, **economics**, political science, sociology, or another social science field required. | Report to a senior social scientist; help designing research projects; manage research execution; report on results, and support R&D initiatives.  Support key research deliverables (large research studies, white papers, case studies, presentations and webinars, guidebooks, templates, roundtable discussions, or custom, in-bound research requests).  Contribute to the day to day management of a large survey panel. | CIVIS Analytics |
| Applied Data Scientist (full time) | Bachelor’s degree in an analytical subject (**economics**, political science, physics, statistics, math, etc.) | Collaborate with clients, Civis Analytics’ R&D and Technology teams, and managers to leverage cutting-edge statistical techniques;  Structure hard problems, analyze large datasets, build predictive models, collaborate in cross-functional teams, create client materials, and deliver projects. | CIVIS Analytics |
| Data Scientist - R&D (full time) | Bachelor’s degree in statistics, computer science, **economics**, physics or other quantitative field | Develop the fundamental data science methods, techniques, and best practices | CIVIS Analytics |
| New Graduate - Data Scientist (full time) | Bachelor’s degree in statistics, computer science, **economics,** physics or other quantitative field | Contribute to research goals of developing new methodological approaches | CIVIS Analytics |
| Data Science Analyst | Diverse backgrounds—roster includes physicists, **economists**, computer scientists, mathematicians, computational linguists, psychologists, and more. | Build predictive models utilizing both statistical methods and machine learning techniques; Extract, clean, and manipulate large datasets model building; Communicate insights from quantitative analyses | AIG |
| Environmental Scientist | Bachelor’s degree in Environmental Studies or closely related field. | Work on a wide variety of environmental compliance projects as they relate to hazardous materials, stormwater and water resources, solid waste, air emissions, petroleum, oils and lubricants and NEPA on a military installation.  Work under the supervision of mid-level and senior environmental scientists and engineers, will be responsible for gathering data necessary to complete compliance reports, plans and environmental permits | HDR |
| Healthcare Data Analyst | Bachelor's degree (BA or BS) in Statistics, Biostatistics, Epidemiology, Public Health, **Economics**, Mathematics, Engineering, Computer Science etc. | Perform study design, data analysis, and report preparation.  Studies originate from preliminary data analysis (trends), literature review, experience and expertise of the team, and mandated projects.  Data analysis, including data preparation and presentation of findings is performed. | Health Integrity |

## 2.3 Data Analyst Salary

A Data Analyst’s salary depends on the candidate’s skills, training, and job responsibilities. As listed in a study provided by “MASTER’S IN DATA SCIENCE”[[12]](#footnote-12), the salary for an entry-level data analyst may range between $35,000 – $45,000 per year. According to [PayScale](http://www.payscale.com/research/US/Job=Data_Analyst/Salary)[[13]](#footnote-13), a Data Analyst’s median salary in 2018 is $61,879 per year. PayScale provides average salary based on city, experience, skills, and employer (see Table 2). For example, they estimate that a Data Analyst in New York earns, on average, $61,047 per year, and this is higher than some other cities, e.g., Chicago.

**Table 2.** Data Analyst Median Salary based on Experience

|  |  |  |  |
| --- | --- | --- | --- |
| **Annual Salary (Average)** | **Entry Level** | **Mid-career** | **Experienced** |
| **New York** | $61, 250 | $74, 254 | $79,976 |
| **Chicago** | $55,903 | $68,252 | $72,000 |
| **Washington, DC** | $59,782 | $74,745 | $84,871 |

Data Source: [PayScale](http://www.payscale.com/research/US/Job=Data_Analyst/Salary)

## 2.4 Internships in Data Analytics and Applied Social Science

Internship surveys conducted by schools and colleges, such as the “*School of Information Summer Internship Survey 2013*” conducted by UC Berkeley School of Information, reports **on** search processes, earnings and employer information for their students. The key findings of this survey are:

* Out of 57 first-year students, almost all (50) got summer internships
* Most of these students worked in the technology industry, but there were a few students who worked in research and retail.
* Intern job titles include: Big Data Analytics Engineer, Data Scientist, Graduate Student Researcher, Creative Technologist, Senior Data Intern, Solutions Architect, and User Experience Research Intern.
* The median hourly salary was $38.75. There were also unpaid internships.
* Methods used in internship search: Online Career Site and School (Career Fair, job announcement email list, recruiting events, alumni)

Many companies offer Summer Internship programs with a variety of data applications in data science and engineering, often combined with research and development. These internship positions are summarized in Table 3, together with information on internship titles, requirements, job descriptions with an emphasis on Big data, and job provider. For the entry-level internship positions, most companies and agencies require an undergraduate degree in one of a variety of fields; these include **economics, social science related degrees, statistics, computer science and math**. Some recent postings are listed in **Table 1.**

**Table 3**: Internship Opportunities in Data Analytics field (Ads Posted Online)

|  |  |  |  |
| --- | --- | --- | --- |
| **Intern Title** | **Requirement in Degree/Major** | **Job Description/ Big Data Component** | **Employer** |
| Data Science - R&D Internship - Summer 2017 | Junior standing in undergraduate degree program in statistics, computer science, **economics**, physics or other quantitative field | Learn modeling strategy, research design, and software engineering;  Work on collaborative projects, predictive analytics, data mining, experimental design and statistical analysis. | CIVIS Analytics |
| Data Research (Summer Interns and Fellows) | Junior standing in undergraduate degree program in statistics, computer science, **economics**, physics or other quantitative field | Research, standardize, and transform a wide variety of datasets to prepare them for analysis and integration into our products | CIVIS Analytics |
| [Research Analyst Intern](http://www.indeed.com/rc/clk?jk=8a4ccbfd3a3c4aad&fccid=bbb3594ec86438e6) | Upper level course work toward bachelor’s degree in business, **economics,** mathematics, or similar field. | Collect and organize data, conduct analysis, and prepare information for reports and presentations | Department of Labor |
| Quantitative Data Analyst Intern | Undergraduate student in Math, Physics, **Economics,** Engineering, or another quantitative field. | Extracting actionable insights from (big) data using data mining, statistical modeling, and database techniques. | CareDash |
| Project Delivery Specialist - Data Scientist/Data | BS/BA in **Economics**, Information Systems, Finance, Statistics, Mathematics, Computer Science or related area | Responsible for manipulating large data files, then transforming the data into business information that helps agencies fulfill strategic objectives. Search for meaningful patterns, trends, and relationships by sifting through large amounts of data and explain the findings to people with varying backgrounds. Preparing executive level presentation to facilitate discussion of analysis. Develop solutions and recommendations for improving data integrity issues. | Deloitte US | Deloitte & Touche LLP |
| Marketing Analytics/Paid Search Intern | BA/BS in **economics,** marketing, analytics, mathematics, or related degree. | Update, maintain, improve, and analyze all marketing reports.  Assist the Analytics Manager and Paid Search Manager as needed with any data, keyword, and analysis projects. | Turn5,inc |
| Research Analyst Intern | Master’s Degree in statistics, **economics,** public policy, urban planning, the social sciences, computer science | Manage a large repository of both qualitative and quantitative data; enforce data integrity and security. Write data processing scripts to calculate indicators. | 100RC (New York) |
| Intern, Real Estate Acquisitions | Bachelor’s Degree earned or in progress, focus on **Economics,** Finance, or Real Estate | Review industry surveys and benchmarks, economic and demographic trends;  Assist with preparing and presenting analysis results in a clear and concise manner | ASH NYC |
| Data Analyst Intern – Part time | Undergraduate student in **Economics**, Business Management, Computer Science, Engineering, Information Science, Statistics, Mathematics, etc. | Collect, cleans, analyze, and interpret structured and unstructured data from various dispersed internal and external sources; Complement data analysis with expert opinions in the data assessment process; Bring together and consolidate all findings | American Reading Company, Inc |
| Oil Research Intern | Have 2+ years of experience in school or in prior internships with investigative analysis | Help research, develop and support a new Gulf Coast Oil Storage product; Documenting, organizing and streamlining all research for easy reference. Analyzing aerial flight data to further infrastructure knowledge. Researching new oil storage projects | Genscape |
| Data Science Intern – Natural Gas Analytics | pursuing or recently completed a 4-year Bachelor's degree | Acquiring and interpreting natural gas and power market data; Creating and interpreting linear regression, time-series, and machine learning models. | Genscape |
| Analytics Intern | Student pursuing major in Statistics, Business, or Mathematics | Analyze web traffic and trends using Big data | Arkadium |
| Intern - Data Engineer | Undergraduate (senior level) or graduate (MS) degree in Computer Science, Statistics, Mathematics, Physics, or related field | Compare performance of software and data tools | Seagate |
| Internship - Technology | Bachelor's degree (rising senior) or Master’s degree in computer science, software engineering, data science/analytics, data security or related technology fields. | Interest in Big Data and exposure to Hadoop | Staples |

**Employers Offering Internships**

A list of firms in the New York City metro area that offer or plan to offer internships for Bachelor’s degree students in Economics in 2016 and 2017 and entry level positions for recent graduates appears below. They include a mix of summer and semester internships for undergraduates pursuing a degree in Economics with strong data science/analytics preparation and training.

1. Deutsche Bank: Global finance; technology; risk; asset management; corporate finance; global markets; human resources;
2. Macy’s (corporate finance)
3. New York City Economic Development Corporation (NYCEDC): economic research and analysis
4. United Nations: Economic affairs
5. StepStone Global: Private equity investor relations
6. Duff and Phelps, LLC: Portfolio valuation
7. Alcoa: Corporate development analyst
8. Metropolitan Phoenix, Inc. NY: Investment financial analyst
9. Carthage Real Estate Advisors: Real Estate Research and Database intern
10. New York Life Insurance Company, NY: Finance Summer Internship
11. Zurich North America: Predictive analytics intern
12. Forest Hills Capital Management: Financial analyst/private equity internship
13. Russell Investments: Intern-portfolio analyst
14. America Needs You
15. Dragon Gate Investment Partners LLC: financial analyst
16. Alliance Bernstein, NY: Technology and operations program
17. SKIM New York: Market research intern
18. Complex, NY: Business Intelligence
19. Women’s World Banking, NY: data analytics
20. Group One Trading, NY: Trading analyst
21. United States Fund for UNICEF, NY: Marketing analyst intern
22. Chloe & Isabel, NY: E-Commerce operations
23. ING, NY: U.S. Wholesale banking
24. S&P Global Ratings, NY: Global ratings credit analyst intern
25. Knewton, NY: Data science internship
26. Alcoa NY: Government affairs intern

# 3. Student Interest and Enrollment

## 3.1 Student Interest

Currently the Social Science Department at City Tech is a service department and does not offer any degree programs to students. Instead we teach different level Economics courses both required and elective to students enrolled in other department programs. Although we do not have a Bachelor or Associate program in Applied or Computational Economics at City Tech, we have/had a number of students who talked to instructors and expressed their interests in pursuing and majoring in this field of study at our college. Since we do not offer this program, certain students said they had to transfer to other CUNY colleges and enroll in other programs. This can also be surmised from the number of students who continued taking upper level economics courses after completing introductory-level economics courses. For instance, 40% of students enrolled in ECON 2301 HD15 (Money and Banking) in spring 2017 semester had taken ECON 1401 (Microeconomics) class first. During that time, ECON 1401 was not a pre-requisite for ECON 2301.

In proposing the BS in Data Analytics in Applied Economics at City Tech, we aim to retain some of the students who are interested in studying computational economics and data science. Our program provides opportunity to our students for further study of more advanced topics than what is being currently offered at City Tech and a chance to apply their data science skills to the field of economics. This is the knowledge/skills package that many firms are looking for. Also, students will be well prepared for graduate programs in the relevant field.

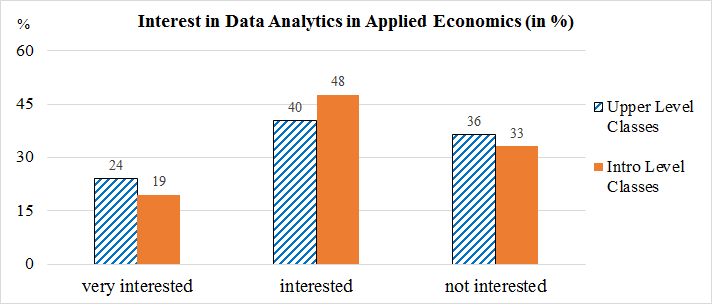
We conducted a students’ interest survey in classrooms at City Tech during the spring 2018 semester to obtain information on whether students are interested in the proposed program and if that interest is related to economics or other fields with an applied focus. Students pursuing Associates or Bachelor’s degree at the time of the survey were questioned. A brief description of the proposed program and an explanation of what the applied economics defines was provided to the students. This survey was conducted among 77 upper-level students in relevant courses that were offered during spring 2018 (ECON 2301, ECON 2820ID, ECON 2505, ECON 2505ID, PHYS 3600ID, MAT 4788) and 284 introductory-level students during the same semester (ECON 1401 Microeconomics and ECON 1101 Macroeconomics).

Results of the survey are analyzed in the following way:

1. Responses from upper-level courses only
2. Responses from introductory-level courses only
3. Combined responses of these two groups of participants

Survey results are illustrated in the figure below. At first, we focus on the responses received in the upper-level classes, out of 77 students, 24% said that they were “very interested” in the Data Analytics in Applied Economics program and an additional 40% said they were “interested”. This means that 64% of all the 77 students indicated interest in our proposed program. Next, we examined the responses received in the intro-level classes only; out of 284 students, 19% said that they were “very interested” in the Data Analytics in Applied Economics program and an additional 48% said they were “interested”. This means that 67% of all the 284 students indicated interest in our proposed program.

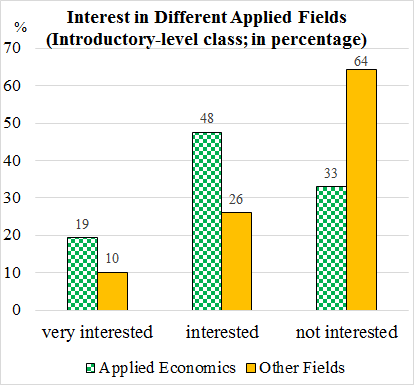
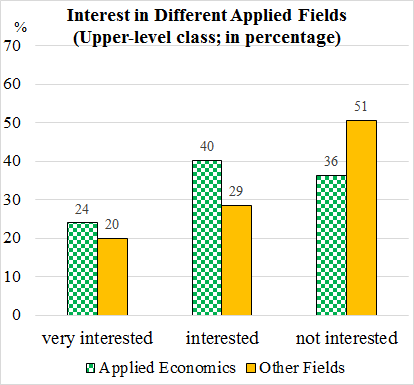
Figure 1: Percentage of students interested in the proposed program



Combined results indicate that around 20% of all the survey participants (361 students) were “very interested” in the proposed Data Analytics in Applied Economics program and an additional 46% responded that they were “interested”. This means that 66% of all the students indicated interest in our proposed program.

In addition, students were asked to rate their interest in different applied fields such as Computer Systems Analysis, Physics, Sociological Analysis, Psychology and Marketing at City Tech. We compared responses (in percentage) for applied economics field with other fields in below figure. The results indicate that while students are interested in all these fields, the most popular field is Applied Economics for this sample.

Figure 2: Student survey results toward different concentrations



From the survey results, we can conclude that our City Tech students are interested in the proposed program of Data Analytics with a focus in Applied Economics. We can also observe that many of our students currently pursuing Associates degrees and enrolled in economics courses are very interested in continuing their studies with further enhancement of their economics knowledge and obtaining data science skills. This demand can be met by offering the proposed Bachelor’s degree program to our students.

## 3.2 Projected Enrollment

Based upon the information from the student interest survey, we can obtain an estimate of enrollment in the program in the initial year and project growth trends over the next five years based upon assumptions about growth and retention.

If the estimate of projected enrollment is limited to just the students in upper division courses who indicated that they were ‘very interested’ in the Applied Economics program, then approximately 18 students (24 percent of the 77 surveyed in upper division courses) could be estimated as likely to enroll in this bachelor’s degree program in the first year. This estimate would be consistent with the information obtained from some of the bachelor’s degree programs that had been newly initiated at other universities.

This estimate would not include potential new students that might transfer from other institutions. If additional enrollment from transfers results in 5 new part-time and 5 additional full-time students each year, then it can be projected that enrollment would grow each year as illustrated in Table 4.

Further, an 80 percent[[14]](#footnote-14) retention rate for first year students, which is the estimate for baccalaureate programs at City Tech, can be assumed for the program.

**Table 4:** Projected Student Enrollment over Five Years

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
| Full-time | 18 | 19 | 23 | 27 | 31 |
| Part-time | 0 | 5 | 9 | 13 | 17 |
| Total | 18 | 24 | 32 | 40 | 48 |

# 4. Other Programs

## 4.1 Other Programs at CUNY

There are several applied two-year degree programs offered at CUNY Community Colleges. These include an A.A.S. degree program in computer information systems with business and/or introductory economics course requirements at Bronx Community College, Borough of Manhattan Community College, and Kingsborough Community College, and an A.A. degree in Economics at Borough of Manhattan Community College that includes some math course requirements. The AAS two-year degrees are applied, preparing students for entry level jobs or to qualify to transfer to four-year degree programs.

1. [Borough of Manhattan Community College - Associate in Applied Science (A.A.S.) in Computer Information Systems](http://www.bmcc.cuny.edu/cis/cis_program.jsp)
2. [Borough of Manhattan Community College – Associate of Arts (A.A.) in Economics](http://www.bmcc.cuny.edu/social-science/economics_program.jsp)
3. [Bronx Community College – Associate in Applied Science (A.A.S.) in Computer Information Systems](http://www.bcc.cuny.edu/Degree-Programs/degrees/AAS/computer_information_systems_aas.pdf)
4. [Kingsborough Community College – Associate in Applied Science (A.A.S.) in Computer Information Systems](http://www.kbcc.cuny.edu/sub-registration/Documents/2015/2014-15_catalog.pdf#page=153)

Students completing the Associate in Arts program in Economics at BMCC are required to have a foundation in math in addition to the minimum of 15 credits in economics. The program prepares students to transfer into a four-year degree program in Economics at CUNY senior colleges. Currently, BMCC has articulation agreements with the four-year degree programs in Economics at Brooklyn College, City College and Hunter College. Although our program proposes an Economics concentration rather than a traditional four-year Economics degree, the students graduating with the A.A. degree may have an interest in entering into an applied program in Data Analytics. Students interested in transferring into the Data Analytics program at City Tech with the two-year Economics degree would likely need to complete additional credits in Math and CST. However, they would transfer having completed more Economics credits than students from the A.A.S. programs.

In addition to providing a foundation in math and computer systems courses, the A.A.S. degree programs in computer information systems require some introductory level applied courses in either business, accounting or economics (either introductory microeconomics or macroeconomics) or both. Although there is some variation among them, the three programs share similarities in focus and course requirements. These programs could provide an excellent opportunity for students wishing to transfer into the Data Analytics program at the New York City College of Technology.

While there are four-year degree programs in computer science, there are no comparable four-year degree programs with an applied Data Analytics with an applied focus within CUNY.

Other related programs within CUNY include:

* + Bachelors:
* **Baruch College**, offers a Data Analytics track as part of their Computing in Information Systems (CIS) Major - Bachelor of Business Administration (BBA) Degree; as well as Data Analytics Minor (as one of IS Business Minors) for the Baruch Weissman School or Arts and Sciences or in the School of Public Affairs.
* **John Jay College of Criminal Justice** offers a BS degree in Applied Mathematics with concentration in Data Science.
* Masters:
* **City College of New York** offers an MS program in Data Science and Engineering.
* **CUNY Graduate Center** offers an MS program in Data Science with topics including artificial intelligence, algorithms for big data, data visualization, information retrieval, data mining, and machine learning.
* **CUNY School of professional studies** offers an online degree program which provides foundational knowledge and hands-on programming competencies, resulting in project-based work samples.
* **Queens College**, a joint program between the Computer Science department and the department of Sociology offers and MS in Data Science.

## 4.2 Data Analytics Programs at Other Universities and Student Enrollment

There is extensive evidence showing that students graduating with a Bachelor’s degree in Data Analytics and with a background or concentration in Economics have a high rate of job placement. Data to support this can be found in the range and type of occupations and industries that undergraduates enter into after graduation, job placement rates, internship opportunities and the increased rate of enrollment in existing Bachelor’s degree level Data Science programs. Although there is data showing that students enrolling in these programs are graduating, many of these degree programs are so new that the information on the number of students graduating from such programs is limited. Many have been implemented within the last two to three years.

We have contacted various institutions that offer bachelor’s degree programs in data analytics throughout the nation. Approximately half of the schools contacted replied to our questions. The following information is compiled based on the responses we got from the four institutions that replied. The majority of programs started in Fall 2014 or later, so the first cohort of students was scheduled to graduate in Spring 2017.

Because of resource limitations such as limited capacity in upper division data courses, program enrollment is limited to 30 students in most of the programs. However, Arizona State University (ASU) reported that the enrollment increased from 52 students in academic year 2014-2015 to 243 students in academic year 2016-2017. Moreover, 95 percent of students who started the program in academic year 2014-2015 completed the degree program. The placements of graduates were not officially tracked at ASU. However, most students were able to get jobs within three months of graduation. Placements at other institutions included companies like 1010 Data in NYC and graduate degree programs. Internship is not required in these programs. In one of the programs, it is replaced by a 6-month long capstone project with external clients. In our correspondence with the program directors, one of them indicated that internships are highly recommended and students had an internship at places like Ernst & Young, JP Morgan and Buffalo Bills.

**Table 5:** Results of survey of Colleges and Universities Currently Offering Data Analytics/Data Science Bachelor’s Degree Programs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Questions asked** | **University of Rochester** | **Ohio State University** | **California Polytechnic State University** | **Arizona State University** |
| Program launch date | Fall 2013 | Fall 2014 | Winter 2015 | Fall 2014 |
| Current Enrollment | 30 (declared majors)  60 (estimated) |  | 30 (program capacity) | 243 (Academic year 2016-2017)  52 (Academic year 2014-2015) |
| # of students graduated | 4 (first round of graduates) | N/A (first cohort graduating in Spring 2017) | 15 (expected) | 49 students |
| Placements | 1010 Data in NYC  MS in data science  Entrepreneurship study at Rochester | N/A | Recruiters are contacting students | Based on an informal survey 90% of students had jobs within 3 months of graduation |
| Internship requirement | - | - | 6-month long capstone project with external clients | Not required but highly suggested. |
| Internship placements | JP Morgan  Ernst & Young  Buffalo Bills | - | N/A |  |

Program names:

**Arizona State University**: Business Data Analytics

**California Polytechnic University**: Data Science

**University of Rochester**: Data Science

**Ohio State University**: Data Analytics

Additional Programs and enrollment (where indicated)

**Northern Kentucky University** Bachelor of Science in Data Science: Enrollment: 23; first graduating class: Spring 2017

**University of California, Irvine** Bachelor of Science in Data Science: Enrollment: No information (program started fall 2015 and site has not been updated); first graduating class: Spring 2019

**Winona State University** Data Science: Enrollment: 15; first graduating class Fall 2015

**University of San Francisco** Data Science

**Florida Polytechnic University** Big Data Analytics

**Becker College** Data Science

**University of Michigan-Ann Arbor** Data Science

**Case Western Reserve University** Data Science

**College of Charleston** Data Science

**St. Mary’s University** Data Science

**George Mason University** Computational Data Sciences

**Virginia Polytechnic Institute and State University** Computational Modeling and Data Analytics

**Massey University** Data Science

A list of additional Data Analytics and Data Science programs is provided in Appendix F.

# 5. Curriculum

## 5.1 Overview of the courses in the Curriculum

CUNY Pathways General Education Requirements (required core, flexible core, college option): **42 credits**

Required/recommended Computer Systems (CST) core courses that provide a necessary foundation in database, problem solving and programming skills that will enhance the analysis of applied economic data: **15 credits**

Economics courses: **33 credits.** These include the applied courses (Applied Microeconomics and Applied Macroeconomics) that address topics in health, finance, public policy, fiscal and monetary policies, environmental problems/policy, sustainable economic growth, international economics and trade; the core theory courses (Intermediate Micro and Intermediate Macroeconomics); Introductory and Advanced Topics in Econometrics; Mapping and Visualizing economic data; and Behavioral Economics.

Required/recommended courses in Mathematics:  **18 credits**

Economics/Social Science Electives: **9 credits**

Internship/independent study: **3 credits**

Free elective credits to total 120: The number of electives can vary depending upon specific course choices or the use of double-duty.

Total credits: 120

## 5.2 Anticipated Learning Outcomes in the Curriculum

**Student Learning Outcomes: General**

1. To develop a firm understanding of complex survey and non-survey data and expertise in working with large scale data sets.

2. The ability to apply tools of econometrics and data science, and to use programming skills to analyze complex economic data and economic/social problems.

3. To develop, strengthen and apply critical thinking skills to economic analysis.

4. To develop and effectively apply mathematical and problem-solving skills.

5. The ability to clearly and effectively communicate ideas orally and in writing.

6. To recognize and to understand the importance of identifying and applying ethical research standards and practices.

**Student Learning Outcomes: Discipline Specific**

In the Data Analytics program, students will be required to take the necessary foundational courses in mathematics, computer systems, statistics and econometrics, and apply their acquired knowledge and programming skills to address issues raised in applied economics courses. The program will offer a variety of applied topics in economics which will present a mixture of theories and practical applications using large-scale non-survey and survey datasets.

The program aims to achieve the following learning outcomes:

7. A strong foundation in statistics, econometrics, and computational economics.

8. A foundation in fundamental economic concepts and theoretical frameworks.

9. The ability to apply critical thinking skills to economic analysis employing complex datasets.

## 5.3 Courses Required to Complete the Program

|  |  |
| --- | --- |
| General Education Common Core | 42 |
| Economics courses (Specialized) | 33 |
| Computer Science courses | 15 |
| Mathematics courses | 18 |
| Other required courses | 9 |
| Internship/Independent Study | 3 |
| **Total number of credits** | **120** |

**General Education Core:**

**Required Core**

ENG 1101: English Composition I 3

ENG 1121: English Composition II 3

Quantitative Reasoning 3

Life and Physical Science (Any) 3

**Flexible Core**

World Cultures & Global Issues 3

U.S. Experience in its Diversity 3

Scientific World 3

Individual and Society 3

Creative Expression 3

6th course from any of the above 3

**College Option**

Speech/Oral Communications 3

Interdisciplinary Course 3

Additional LA I 3

Additional LA II 3

**Sub-total 42**

**Program General Education Required**

Introduction to Psychology PSY 1101 3

Symbolic Logic PHIL 2202 3

Sociology of Numbers SOC 3303 3

Statistics with Probability MAT 1372 3

Introduction to Computer Systems CST 1100 3

Problem Solving with Computer Programming CST 1101 3

**Sub-total 18**

Students must complete a total of 60 credits in general education courses. If students take any of the program required general education courses as part of the General Education Common Core, they should complete the general education requirements by taking one or more of the following General Education Electives:

**GenEd electives to complete 120 credits:**

Money and Banking ECON 2301 3

Labor Management Relations ECON 2403 3

US Economic History ECON 2705 3

Environmental Economics ECON 2505ID 3

**Core Program Requirements in Math and CST**

**Mathematics**

Calculus I MAT 1475 4

Calculus II MAT 1575 4

Calculus III MAT 2675 4

Introduction to Linear Algebra MAT 2580 3

**Sub-total 15**

**Computer Systems Technology**

Programming Fundamentals CST 1201 3

Database Fundamentals CST 1204 3

Introduction to Data Science CST 2402 3

**Sub-total 9**

**BS major core requirements:**

**Economics Courses**

Microeconomics ECON 1401 3

Macroeconomics ECON 1101 3

Introductory Econometrics ECON 2201 3

Advanced Topics in Econometrics ECON 3201 3

Intermediate Microeconomics ECON 2401 3

Intermediate Macroeconomics ECON 2101 3

Applied Microeconomics ECON 3401 3

Applied Macroeconomics ECON 3101 3

Visualizing and Mapping Economic Data ECON 3301 3

Behavioral Economics ECON2820ID 3

Introduction to Statistical Learning ECON 3801 3

**Sub-total 33**

**ECON 4201 Internship/Research project** 3

**Sub-total 3**

**TOTAL 120**

## 5.4 Sample four-year course program

|  |  |  |
| --- | --- | --- |
| **FIRST YEAR** | | |
| **First Semester** | | |
| Required Core/ENG 1101 | English Composition I | 3 |
| Required Core/Quantitative Reasoning/MAT 1375 | Precalculus (recommended) | 3 |
| ECON 1401 | Microeconomics | 3 |
| CST 1100 | Introduction to Computer Systems | 3 |
| PSY 1101 | Introduction to Psychology | 3 |
|  | TOTAL | 15 |

|  |  |  |
| --- | --- | --- |
| **Second Semester** | | |
| Required Core/ENG 1121 | English Composition II | 3 |
| PHIL 2202 | Symbolic Logic | 3 |
| MAT 1475 | Calculus I | 4 |
| ECON 1101 | Macroeconomics | 3 |
| CST 1101 | Problem Solving with Comp. Programming | 3 |
|  | TOTAL | 16 |

|  |  |  |
| --- | --- | --- |
| **SECOND YEAR** | | |
| **First Semester** | | |
| MAT 1372 (pre-req mat 1375) | Stat with Probability (serve a pre-req to Intro Econometrics) | 3 |
| Required Core: Life &Physical Science | Any | 3 |
| MAT 1575 | Calculus II | 4 |
| CST 1201 | Programming Fundamentals | 3 |
| ECON 2820ID | Behavioral Economics | 3 |
|  | TOTAL | 16 |

|  |  |  |
| --- | --- | --- |
| **Second Semester** | | |
| ECON 2201 | Introductory Econometrics | 3 |
| SOC 3303 | Sociology of Numbers | 3 |
| MAT 2675 | Multivariable Calculus | 3 |
| CST 1204 | Database Fundamentals | 3 |
| Additional Liberal Arts I |  | 3 |
|  | TOTAL | 15 |

|  |  |  |
| --- | --- | --- |
| **THIRD YEAR** | | |
| **First Semester** | | |
| ECON 2401 | Intermediate Microeconomics | 3 |
| ECON 3201 | Advanced Topics in Econometrics | 3 |
| CST 2402 | Introduction to Data Science | 3 |
| MAT 2580 | Introduction to Linear Algebra | 3 |
| Flexible Core/Individual & Society | Any | 3 |
|  | TOTAL | 15 |

|  |  |  |
| --- | --- | --- |
| **Second Semester** | | |
| ECON 2101 | Intermediate Macroeconomics | 3 |
| ECON 3801 | Introduction to Statistical Learning | 3 |
| Flexible Core/Scientific World | Any | 3 |
| Flexible Core/U.S. Experience in Its Diversity | Any | 3 |
| Flexible Core/WCGI | ANY | 3 |
|  | TOTAL | 15 |

|  |  |  |
| --- | --- | --- |
| **FOURTH YEAR** | | |
| **First Semester** | | |
| ECON 3401 | Applied Microeconomics | 3 |
| ECON 3101 | Applied Macroeconomics | 3 |
| ECON 3301 | Visualizing and mapping economic data | 3 |
| College Option/Speech/Oral Communication | Any | 3 |
| Flexible Core/Creative Expression | Any | 3 |
|  | TOTAL | 15 |

|  |  |  |
| --- | --- | --- |
| **Second Semester** | | |
| ECON 4201 | Internship/Research Project | 3 |
| Additional Liberal Arts II | Any (advanced) | 3 |
| College Option/Interdisciplinary Course | Any | 3 |
| Flexible Core/Any | Any | 3 |
|  | TOTAL | 12 |

## 5.5 Mapping Anticipated Learning Outcomes to the Courses

The following table maps general and discipline specific learning outcomes 1 – 10 to the courses required for the program (see section 5.2 Anticipated learning outcomes in the curriculum).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | General  Learning  Outcomes | | | | | | Discipline Learning Outcomes | |  |
| Courses | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| ECON 2101: Intermediate Macroeconomics |  |  | x | x | x |  |  | x |  |
| ECON 2401: Intermediate Microeconomics |  |  | x | x | x |  |  | x |  |
| ECON 2201: Introductory Econometrics | x | x | x | x | x | x | x | x | x |
| ECON 3201: Advanced Topics in Econometrics | x | x | x | x | x | x | x | x | x |
| ECON 3801: Introduction to Statistical Learning |  | x | x | x |  |  | x |  | x |
| ECON 3101: Applied Macroeconomics |  | x | x | x | x | x | x | x | x |
| ECON 3401: Applied Microeconomics |  | x | x | x | x | x | x | x | x |
| ECON 3301: Visualizing and Mapping Economic Data |  |  | x | x | x | x | x | x | x |
| ECON 4201: Internship/Research Project |  | x | x | x | x | x | x |  | x |
| ECON 2820ID: Behavioral Economics |  |  | x | x | x | x |  | x |  |
| SOC 3303: Sociology of Numbers |  |  | x |  | x | x |  |  |  |
| PHIL 2202: Symbolic Logic |  | x |  | x | x |  |  |  |  |
| MAT 1475: Calculus I |  |  |  | x |  |  | x |  |  |
| MAT 1575: Calculus II |  |  |  | x |  |  | x |  |  |
| MAT 1372: Statistics and Probability |  |  |  | x |  |  | x |  |  |
| MAT 2675: Multivariable Calculus |  |  |  | x |  |  | x |  |  |
| MAT 2580: Introduction to Linear Algebra |  |  |  | x |  |  | x |  |  |
| CST 1100: Introduction to Computer Systems | x |  |  |  | x | x |  |  |  |
| CST 1101: Problem Solving with Computer Programming |  | x |  |  | x |  |  |  |  |
| CST 1201: Programming Fundamentals |  | x |  |  | x |  |  |  |  |
| CST 1204: Database Fundamentals |  |  |  |  | x |  |  |  |  |
| CST 2402: Introduction to Data Science\*\* |  | x | x | x |  |  |  |  |  |
| ECON 4201: Internship/Research Project |  | x | x | x | x | x |  |  | x |

**\*This is a new course proposed by the Math Department.**

**\*\* This is a new course proposed by CST that is currently in review.**

**Mapping of Program Level Outcomes to College Mission**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 | 6 |
| Provide broad access to high quality technological and professional education for a diverse urban population | x | x | x | x | x | x |
| Emphasize applied skills and place-based learning |  | x | x |  |  |  |
| problem-solving skills | x | x | x | x | x |  |
| Understanding of the social contexts of technology |  | x | x |  | x | x |
| Multi- disciplinary approach and creative collaboration |  | x | x | x |  | x |

## 5.6 Catalog Description of New Economics Courses

### **5.6.1 ECON 2201 Introductory Econometrics**

This course introduces the theoretical foundations of econometrics and empirical methods used for data analysis in economics. Techniques for estimating econometric models including simple and multiple regression analysis with cross-sectional data are discussed and hypotheses tests are conducted. Covered topics are ordinary least squares estimation, the Gauss-Markov theorem, statistical inference, prediction, goodness-of-fit, heteroskedasticity, serial autocorrelation, and the Central Limit Theorem. Time series analysis is studied at an introductory level. Discusses survey sampling methods and practical implementation. The focus is on empirical applications.

### **5.6.2 ECON 3201 Advanced Topics in Econometrics**

This course teaches advanced empirical methods and provides various exercises to apply newly learned methods to real-world problems. The topics that will be covered include fixed effects and random effects models, instrumental variables estimation, limited dependent variable models and advanced time series topics such as cointegration and error correction models. With the skills that the students acquire in this course, they will be able to test economic theories and conduct policy analysis and program evaluation using a statistical software package such as R and/or Stata. The course requires a background in college algebra, basic concepts in probability and statistics, and introductory econometrics.

### **5.6.3 ECON 3801 Introduction to Statistical Learning**

This course introduces students to the primary concepts and tools of machine learning that social scientists have started to utilize with the availability of large datasets. The topics that will be covered include overfitting problem, cross-validation, penalized regression models, classification and regression trees. Students will apply off-the-shelf prediction methods to various economic and social problems using a statistical programming language such as R or Stata. This course requires a background in basic concepts of probability and statistics, standard classification models studied in advanced econometrics class, and a knowledge of matrix operations.

### **5.6.4 ECON 2401 Intermediate Microeconomics**

This course provides fundamental conceptual and methodological foundations of microeconomic theory at a greater depth and more rigorous manner than in introductory principles courses. Microeconomics analyzes the behavior of fundamental decision makers in a society such as consumers, workers, savers, firms, managers, individual industries and markets. It looks at the factors that influence the choice of individual decision makers and how they interact to determine the working of broader economic systems.

### **5.6.5 ECON 2101 Intermediate Macroeconomics**

This course introduces modern macroeconomic theory at an intermediate-level and studies the entire economy in the short, medium, and long term. The effects of macroeconomic policies at the national level and on a global scale are discussed. Topics include both exogenous and endogenous growth models, the modern Phillips curve, a dynamic model for economic fluctuations, and theories for exchange-rate determination. An in-depth study of equilibrium in the goods and money markets, balance of payments, and aggregate supply and demand. Provides alternative perspectives to theories.

### **5.6.6 ECON 3401 Applied Microeconomics**

This course introduces students to important social and economic problems in the United States and provides real-world applications of data science. Through leading research in the field of applied microeconomics, students will study how researchers use big data to understand and tackle problems that we currently face in fields such as education, health, environment, and justice. Students will have the opportunity to utilize their knowledge and skills that were obtained previously in courses like statistics, econometrics and machine learning to understand and analyze important social and economic problems of our time.

### **5.6.7 ECON 3101 Applied Macroeconomics**

This course introduces applications of macroeconomic theory and principles to topical issues. Introduces numerical methods used in modern macroeconomic research, and the application of models to big datasets. Provides students the ability to construct and estimate models, and to develop complex relationships between economic aggregates. Applies methods and results in the evaluation of fiscal, monetary, and trade policy. Using the empirical and computational techniques of modern Data Science, monitoring of macroeconomic conditions, drivers of long-term sustainable growth, policy shocks, business cycles, and optimal debt are discussed.

### **5.6.8 ECON 3301 Visualizing and Mapping Economic Data**

This course offers an introduction to presenting data visually in maps and charts, with a focus on data analysis in applied contexts including health, labor market, household, demographic, and environmental data. Topics include summarizing and analyzing visualized data and preparing story maps.

### **5.6.9 ECON 4201 Internship/Research Project**

Supervised work experience in Data Analytics. The experience may be with a small, medium or large company or a governmental agency. The focus of the internship is for students to gain experience in employing the methods and tools of data analytics in settings examining Economic and related data. Students will maintain a log/ journal documenting and detailing their work experience. This will be submitted to the faculty member coordinating the internship at least twice during the semester. A final oral and written presentation of the internship experience will be shared with the entire internship group. The worksite supervisor and the faculty member coordinating the internship will evaluate the intern.

# 6. Faculty

The Social Science Department currently has four full-time Economics faculty who are qualified to teach the courses that are required in the proposed Bachelor of Science degree program. In addition, there are approximately 16 part-time faculty in Economics.

## 6.1 Faculty names and areas of specialization (in alphabetical order)

Gulgun Bayaz Ozturk

1. Education: Ph.D. in Economics, University of Connecticut
2. Areas of Interest: Labor Economics and Health Economics.

Randall Hannum

1. Education: Ph.D. in Economics, Fordham University
2. Areas of Interest: Public Policy and Replications in Economics

Sean P. MacDonald

1. Education: Ph.D. in Economics, The New School for Social Research, New York, NY
2. Areas of Interest: Housing Markets, Income Inequality and Public Policy, and Environmental Economics

Unurjargal Nyambuu

1. Education: Ph.D. in Economics, The New School for Social Research, New York, NY, USA
2. Areas of Interest: Sustainable Economic Growth, Macroeconomic Dynamics, International Economics, and Macroeconomic Policy.

## 6.2 Faculty expertise needed

While it is believed that many of the courses in the program can be taught by current faculty in Economics, CST and Math, it is expected that to fulfill specialized needs in some courses, an additional full-time position in Economics would be a strength for the program.

# 7. Cost Assessment

Most of the software that is needed for the core required courses in CST and Math is either open source (such as R) or otherwise readily available on existing computers in the CST and math departments. In addition, Stata, which would be used in some Economics courses, will also be requested for some computer rooms. The funding for these can be sought through the college Tech Fee or OTPS funds.

In addition, as the program expands and more of the program’s Econometrics and Applied macroeconomics and microeconomics courses are offered, there will likely be a need for more computer facilities in classrooms. This would likely require that these rooms have the necessary software installed. At the same time, depending upon specific course and faculty needs, there may also be a need for a CLT position.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** |
| 1. Additional  Personnel (CLT) | $65,000 | $68,000 | $71,000 | $74,000 | $77,000 |
| 2. OTPS | $ | $ | $ | $ | $ |

Estimated using the PSC-CUNY salary schedule

# 8. Computer/lab needs

Since many of the Economics courses in the program will require classroom use of computers, it will be necessary to ensure that there are sufficient computer lab rooms to accommodate this need. This should not require the acquisition of new equipment, but a coordination of scheduling to ensure availability and planning so that the needed software for scheduled courses has been installed on these computers.

# Appendix A: Economics Discipline Meeting Minutes

**April 20, 2017**

4/20/2017

Economics Discipline Meeting Minutes

Attendance: Gulgun Bayaz Ozturk, Randall Hannum, Jean Hillstrom, Sean McDonald, Unurjargal Nyambuu

Meeting started at 11:00am.

1. The meeting started with a review of ECON 1101 assessment questions and identifying the questions that satisfy General Education learning outcomes. We have decided that questions 1, 2, 5 and 10 satisfy the first Gen Ed learning outcome (i.e., knowledge), questions 3, 4, 9 meet the second Gen Ed learning outcome (i.e., skills), questions 6, 7 and 8 meet the third Gen Ed learning outcome (i.e., integration).

If instructors decide to use assessment questions in their final exam, then they need to contact Sean or Gulgun to talk about how the exam should be structured so that the answers to assessment questions can be easily identified.

Assessment packages will be requested by next week.

Assessment memo will be sent to all Econ faculty (please see the draft of the memo at the end of the document).

1. We need to underlie how the Big Data program that the Social Science Department wants to develop differs from the Data Science program proposal of the Computer Systems Technology (CST). Applied degree programs such as the ones offered at Queens College, Department of Sociology and the School of Professional Studies are more in line with what we would like to offer. So, we need to gather information on their degree programs.
2. Gulgun will contact Prof. Geet Dhondt at John Jay College of Criminal Justice to give a talk on how to incorporate heterodox approaches to economics teaching in Fall 2017. If we can generate enough interest among economics faculty, we can undertake further steps to have a mini conference on teaching heterodox economics in the future. Gulgun may contact Barbara Burke or the Dean (after July 1st) for possible funding sources for the events mentioned above.
3. We have talked about a minor curriculum change (assigning a prerequisite such as math certification) in Consumer Economics. Also, Gulgun will contact the Dean to learn about the procedure to make the course a credit-bearing course in AA or AS degrees. Unra will work on the curriculum change in Money & Banking.

Application materials for Pathways designation of the following courses; Money and Banking (revised by Unra), Consumer Economics (Gulgun) and Economic History of the U.S. (Sean) will be prepared.

Curriculum modification forms and Pathways forms (if possible) must be ready for department approval on May 4th, 2017. Please also note that the Pathways application deadline is April 28th. The completed forms should be sent to Jean by April 27th.

1. Next meeting will be held on Tuesday, May 16th, 2017 at 11:00 am.

Meeting ended at 12:40pm.

Submitted by Gulgun Bayaz Ozturk.

**May 16, 2017**  5/16/2017

Economics Discipline Meeting Minutes

Attendance: Gulgun Bayaz Ozturk, Randall Hannum, Sean McDonald, Unurjargal Nyambuu

Meeting started at 11:00am

1. Sean has provided economics faculty with the updates on Big Data program proposal from their meeting with the Dean Vazquez-Poritz. There are four deliverables that the administration requires. Sean and Gulgun will work on the deliverables.

Deliverables

* Concept Paper (see the new program proposal guidelines from the College Council)
* Outline of course requirements: We have also agreed to look at relevant master’s program degree requirements which can help us determine the courses and outlines for the proposed program.
  + 1. Brief description of courses and topics that will be covered. Course-specific outcomes for those courses. For advanced courses such as intermediate micro and macroeconomics, we can talk about the General Education learning outcomes.
    2. Possible courses that can be developed:
       1. International Economics (a combination of international finance, international trade and financial economics).
       2. Health economics
       3. Managerial economics
       4. IO
       5. If econometrics is taken in Math or CST programs, the introduction to econometrics can be changed to Applied Econometrics or Applied Statistics to Economics and Business. These courses may require a basic knowledge of statistics or econometrics. We need to contact Math department to find out the statistics covered in MAT 1372.
* Potential articulation agreements with 2-year CUNY colleges which offer degree programs such as computer programming and mathematics (Queensborough, BMCC, La Guardia) that might feed into the program.
* What do these articulation agreements look like? What courses should the students have so that they can complete their studies in 2 years after transferring to City Tech?
* Which master’s program can the students continue? See programs at Queen’s College, School of Professional Studies, Grad Center. Enrollment in master’s program at other CUNY programs might be good to know. It would be helpful to look at the Queen’s College Big data program to see how they incorporate the applied part such as the use of software, the choice of textbooks that use software and so on.

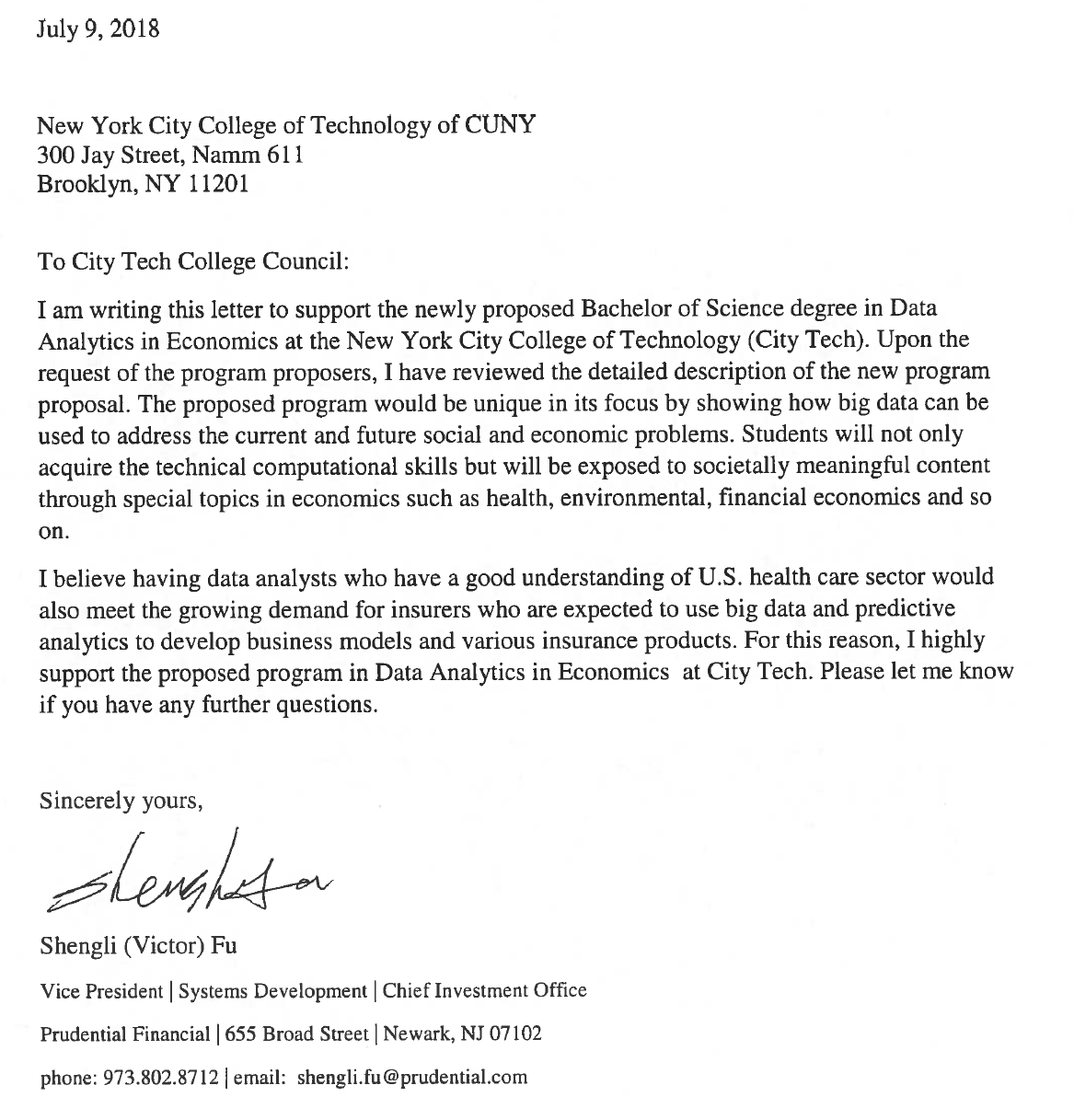
1. Gulgun has contacted Prof. Geert Dhordt to give a talk on heterodox approach in economics. He is willing to give a talk in Fall 2016. We have decided to propose Monday or Wednesday at 11:00 am. We need to check the calendar so that the proposed date does not conflict with the major holidays. We would propose to schedule the event at the Faculty Lounge.
2. Unra has sent the minor curriculum modification application form for ECON 2301 to Math and CST departments for approval. And, she is currently working on the Pathways application form for ECON 2301. Randy mentioned the possibility of having it as a capstone course which requires a separate application.
3. Randy will request information regarding the math skills of students taking ECON 1101 or ECON 1401 from the CIS.

Meeting ended at 12:40pm.

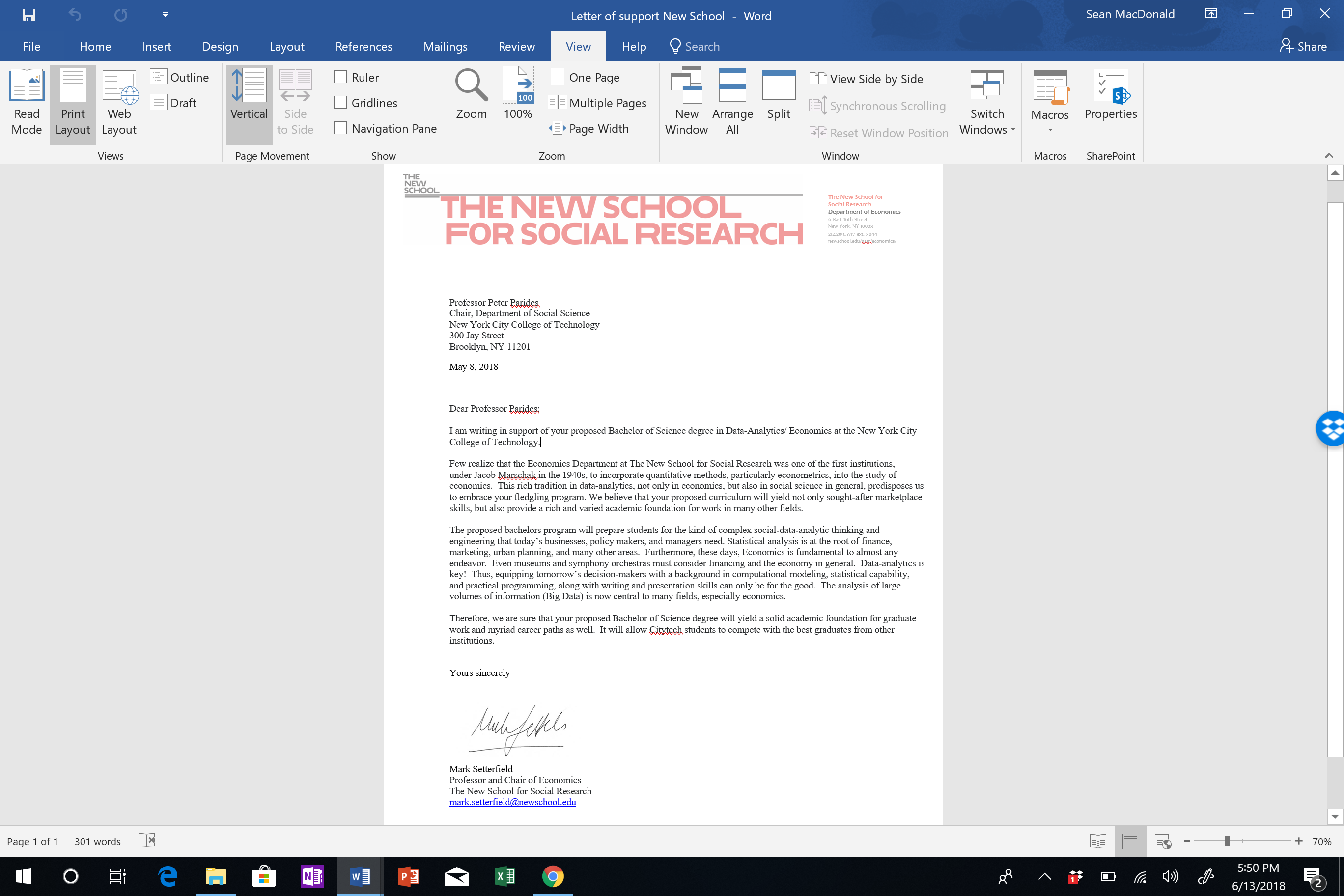
Meeting minutes are submitted by Gulgun Bayaz Ozturk

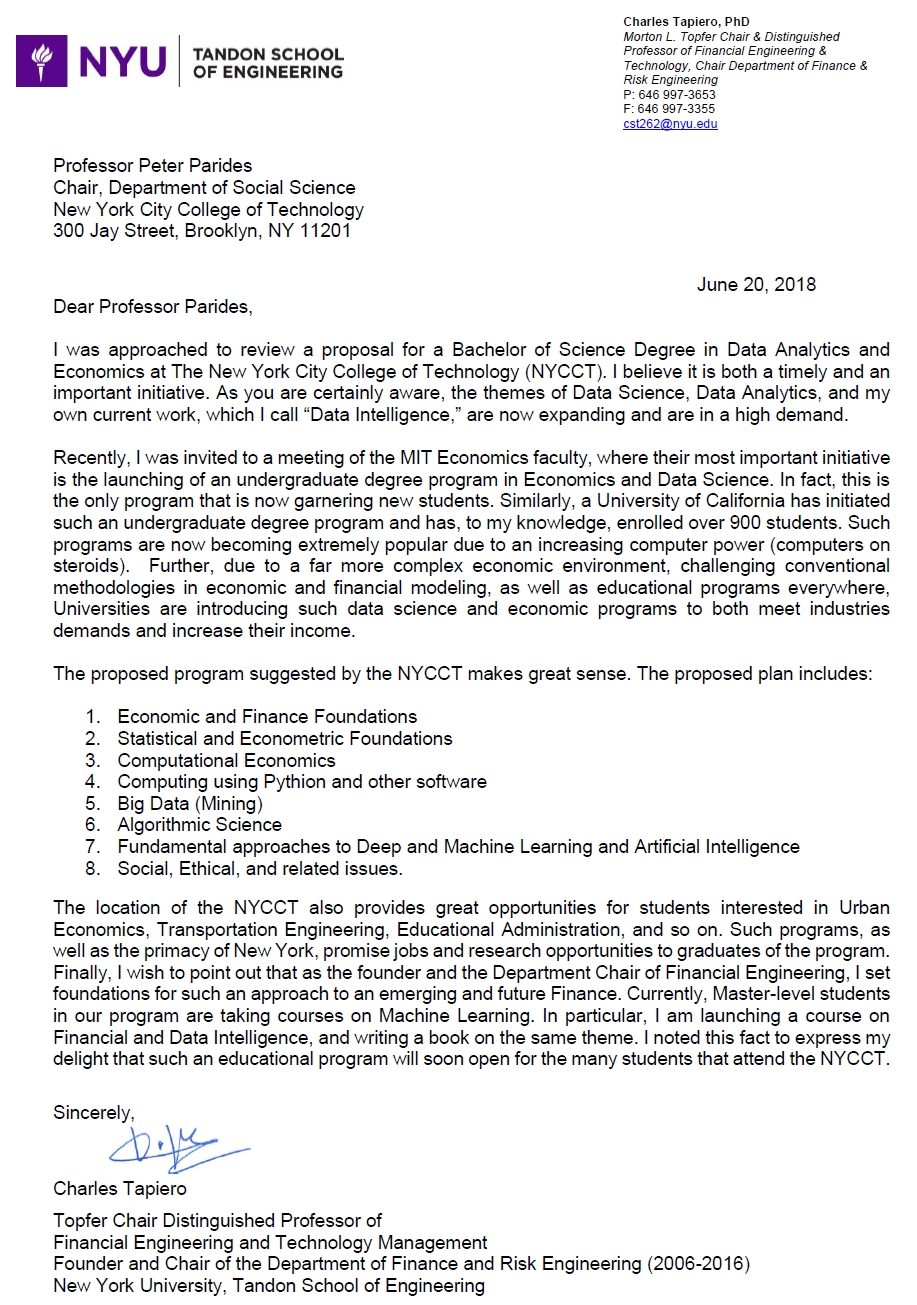
# Appendix B: Letters of Support

## B.1 Letters of Support from Industry

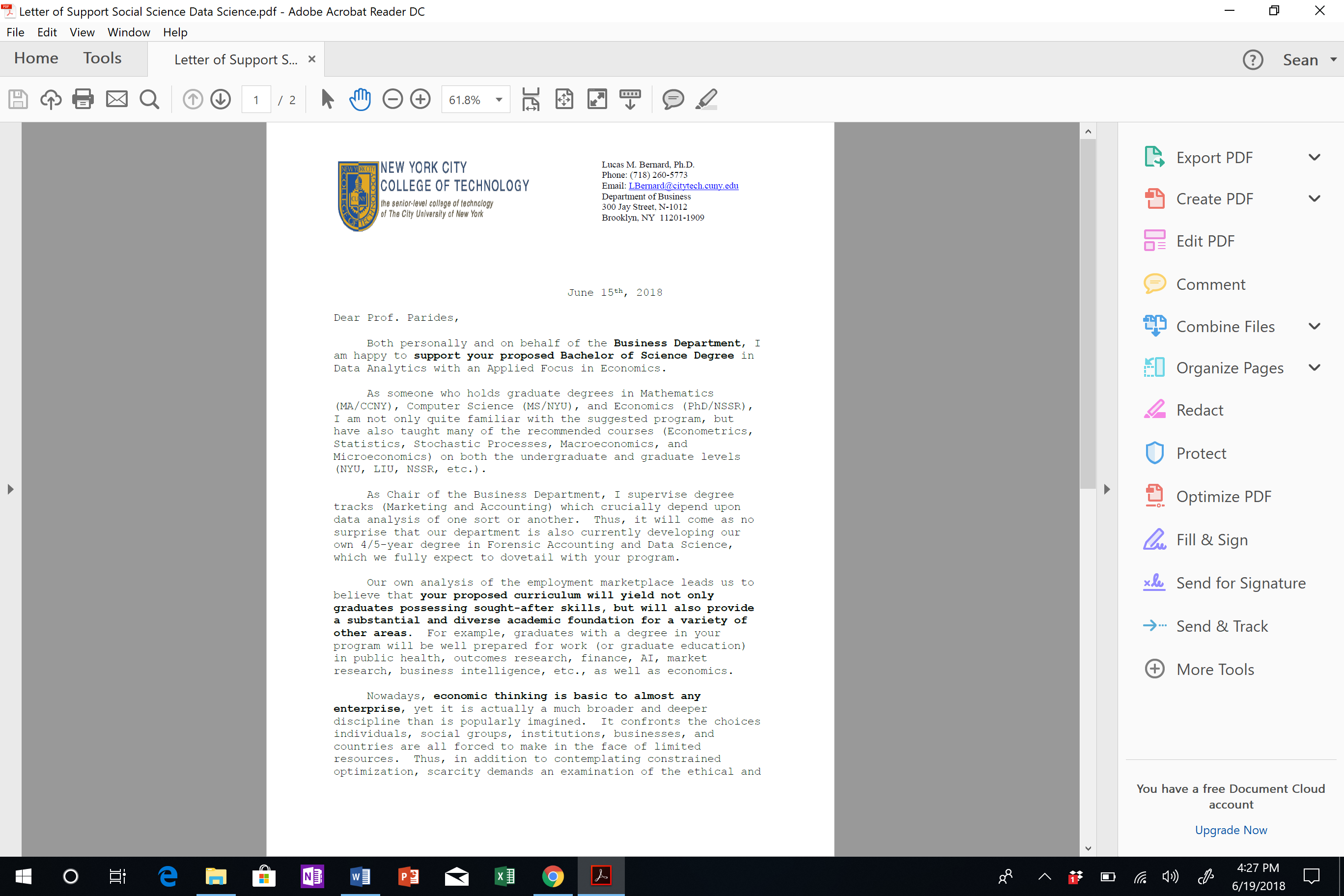


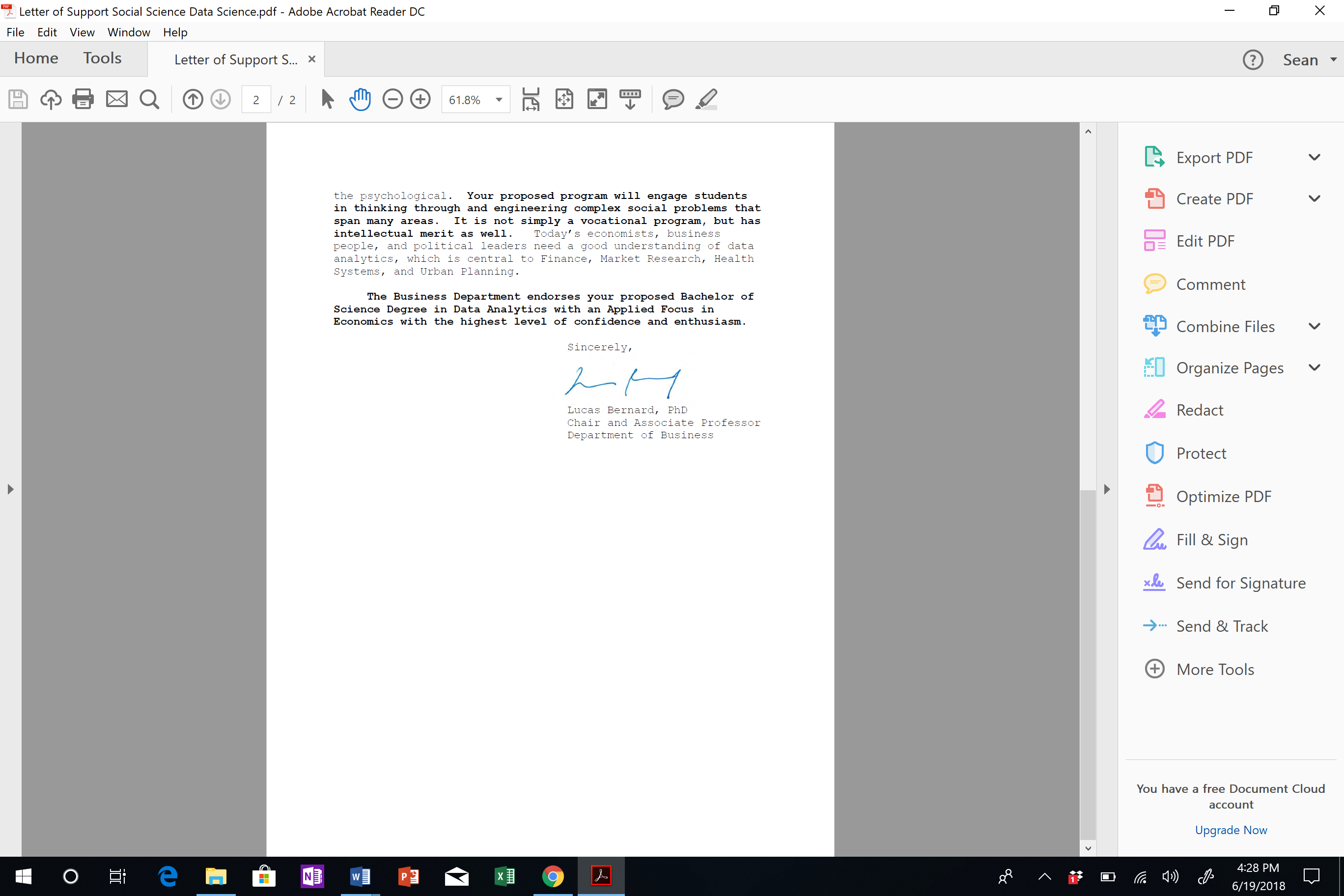
## B.2 Letters of Support from Graduate Programs in the NYC Area





## B.3 Letters of Support from Departments at City Tech





**From:** Hong Li <[HLi@citytech.cuny.edu](mailto:HLi@citytech.cuny.edu)>  
**Date:** August 28, 2018 at 3:44:34 PM EDT  
**To:** Peter Parides <[PParides@citytech.cuny.edu](mailto:PParides@citytech.cuny.edu)>  
**Subject:** **support of our proposal**

Dear Prof. Parides,

I hope this email serve the purpose.

On behalf of the Computer Systems Technology department, I am happy to **support your proposed Bachelor of Science Degree**in Data Analytics with an Applied Focus in Economics.

A team of CST faculty members has worked closely with faculty from your department, email and meetings discussing both our new degree proposal and your proposals.

I anticipate more collaboration of both department as the programs evolve.

Sincerely,

Hong Li, Ph.D.

Associate Professor and Chair

Department of Computer Systems Technology

New York City College of Technology

City University of New York

300 Jay Street N914

Brooklyn, NY 11201

Phone: (718) 260-5170

Email: [hli@citytech.cuny.edu](mailto:hli@citytech.cuny.edu)

## B.4 Evidence of Consultation with Affected Departments: Computer Systems Technology and Mathematics

**Computer Systems Technology:**

6/1/2018 Mail - SMacdonald@citytech.cuny.edu

https://webmail.citytech.cuny.edu/owa/#path=/mail/search/rp 1/3

Re: Data Analytics in Economics

Hi Justin,

Thanks so much. I am much better,

Best,

Sean

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Sean P. MacDonald

Associate Prof. - Economics

Dept. of Social Science

New York City College of Technology

718-260-5084

smacdonald@citytech.cuny.edu

**From:** Justin Vazquez-Poritz

**Sent:** Friday, March 16, 2018 3:28:42 PM

**To:** Sean Macdonald

**Subject:** Fw: Data Analytics in Economics

Dear Sean,

I hope that you're feeling better. Rest up and have a good weekend!

Best wishes,

Justin

Justin Vázquez-Poritz, PhD

Dean, School of Arts and Sciences

New York City College of Technology

300 Jay Street, Namm 321

Brooklyn, NY 11201

Phone: 718-260-5008

Email: JVazquez-Poritz@citytech.cuny.edu

**From:** Sean Macdonald

**Sent:** Friday, March 16, 2018 1:55 PM

**To:** Hong Li; Gulgun BayazOzturk; Randall Hannum; Unurjargal Nyambuu; Ashwin Satyanarayana; Candido Cabo; Elena Filatova; Elizabeth

Milonas; Ossama Elhadary

**Cc:** Justin Vazquez-Poritz; Peter Parides

**Subject:** Re: Data Analytics in Economics

Hong,

Sean Macdonald

Sat 3/17/2018 9:44 AM

Sent Items

To:Justin Vazquez-Poritz <JVazquez-Poritz@citytech.cuny.edu>;

6/1/2018 Mail - SMacdonald@citytech.cuny.edu

https://webmail.citytech.cuny.edu/owa/#path=/mail/search/rp 2/3

Thank you so much. The suggestions from CST were very helpful in terms of identifying the courses that will provide students in the Data Analytics program with the basic skills needed. The fundamentals courses that were recommended will be good.

And agreed, once we have begun to develop course outlines for the Economics courses, we should have a clearer idea of what kinds of tools and - additional courses - would be the best fit.

We will be following up with the Math department in the next week or so as well and will definitely follow up again with your group as we begin developing the new Economics courses.

Many thanks,

Sean

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Sean P. MacDonald

Associate Prof. - Economics

Dept. of Social Science

New York City College of Technology

718-260-5084

smacdonald@citytech.cuny.edu

**From:** Hong Li

**Sent:** Thursday, March 15, 2018 5:02:00 PM

**To:** Sean Macdonald; Gulgun BayazOzturk; Randall Hannum; Unurjargal Nyambuu; Ashwin Satyanarayana; Candido Cabo; Elena Filatova;

Elizabeth Milonas; Ossama Elhadary

**Cc:** Justin Vazquez-Poritz; Peter Parides

**Subject:** Re: Data Analytics in Economics

Thank you all for participation in the meeting today.

To summarize recommendation from CST,

1. Fundamental courses will prepare student with basic programming skills:

a. CST1100 Introduction to Computer Systems

b. CST1101 Problem Solving with Computer Programming

c. CST1201 Programming fundamentals

d. CST1204 Database fundamentals

e. CST2412 Introduction to Data Science

2. For remaining credits, we suggest 1. Discuss with math department if any additional course helpful, 2. Add additional ECON courses that will bridge student to the set of new courses you plan to develop related to data analytics in Economics. That may be depend on what tools (such as R, Python, WEKA, SAS, SPSS, etc) you decide to use in your new courses.

3. When you develop your Economics Courses, please work with us so that courses can benefit students from both your program and our proposed Data Science program

Hong Li, Ph.D.

Associate Professor and Chair

Department of Computer Systems Technology

New York City College of Technology

City University of New York

300 Jay Street N914

Brooklyn, NY 11201

Phone: (718) 260-5170

Email: hli@citytech.cuny.edu

**From:** Sean Macdonald <SMacdonald@citytech.cuny.edu>

**Date:** Wednesday, March 14, 2018 at 8:23 PM

6/1/2018 Mail - SMacdonald@citytech.cuny.edu

https://webmail.citytech.cuny.edu/owa/#path=/mail/search/rp 3/3

**To:** Gulgun BayazOzturk <GBayazOzturk@citytech.cuny.edu>, Randall Hannum <RHannum@citytech.cuny.edu>, Unurjargal

Nyambuu <UNyambuu@citytech.cuny.edu>, Hong Li <HLi@citytech.cuny.edu>, Ashwin Satyanarayana

<ASatyanarayana@citytech.cuny.edu>, Candido Cabo <CCabo@citytech.cuny.edu>, Elena Filatova

<EFilatova@citytech.cuny.edu>, Elizabeth Milonas <EMilonas@citytech.cuny.edu>

**Cc:** Justin Vazquez-Poritz <JVazquez-Poritz@citytech.cuny.edu>, Peter Parides <PParides@citytech.cuny.edu>

**Subject:** Data Analytics in Economics

Dear all,

Attached are the items we would like to review at tomorrow's meeting.

Also attached is the listing of the recommended CST courses in the context of the overall program outline - on pages 6 and 7.

Regards,

Sean

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Sean P. MacDonald

Associate Prof. - Economics

Dept. of Social Science

New York City College of Technology

718-260-5084

smacdonald@citytech.cuny.edu

**Mathematics:**

6/1/2018 Mail - SMacdonald@citytech.cuny.edu

https://webmail.citytech.cuny.edu/owa/#path=/mail/search/rp 1/3

RE: Data Analytics in Economics

Confirmed, for meeting on Tuesday April 17.

***Sandie Han, Ph.D.***

*Mathematics Department, Chair*

*New York City College of Technology*

*Brooklyn, NY 11023*

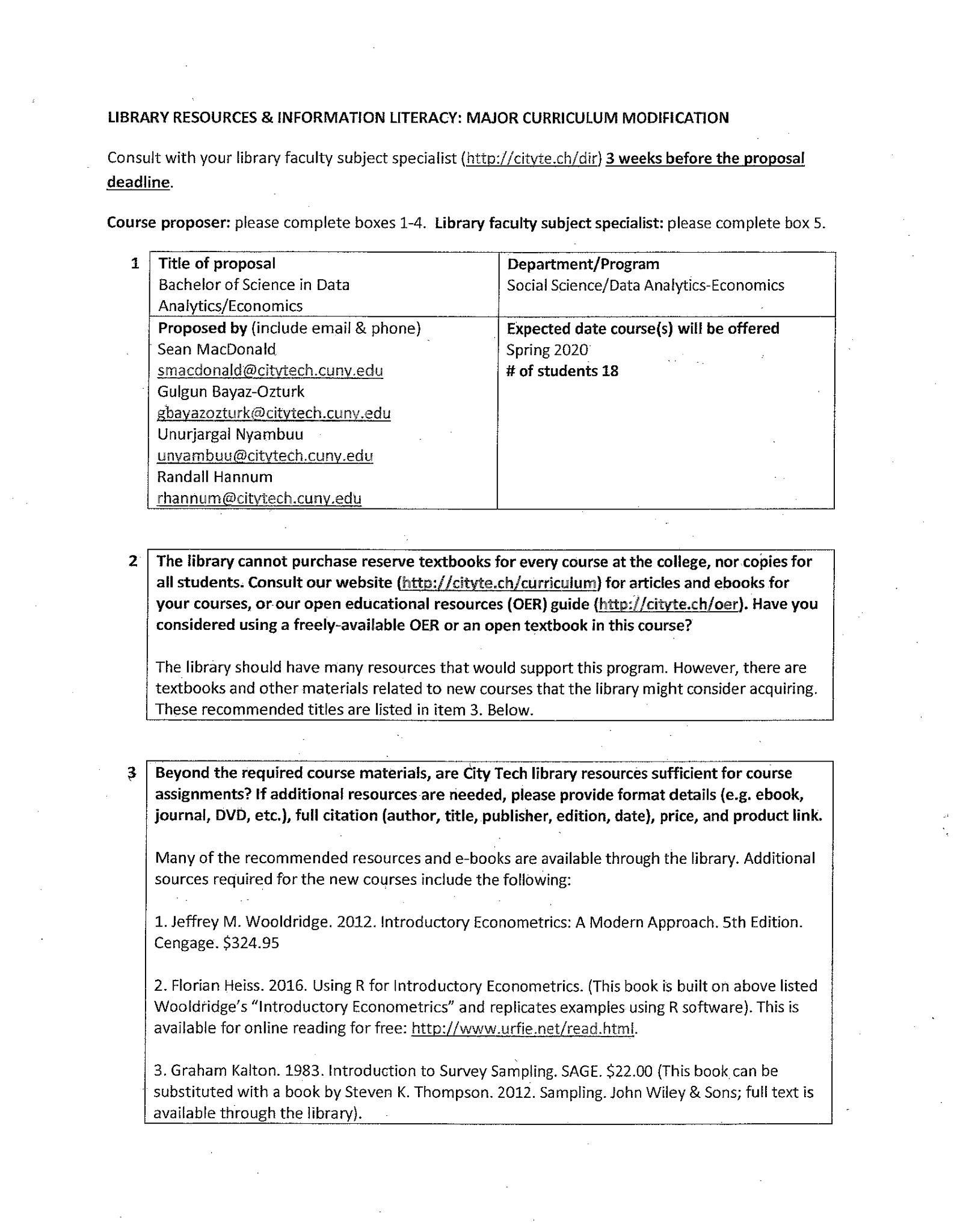
*718-260-5380*

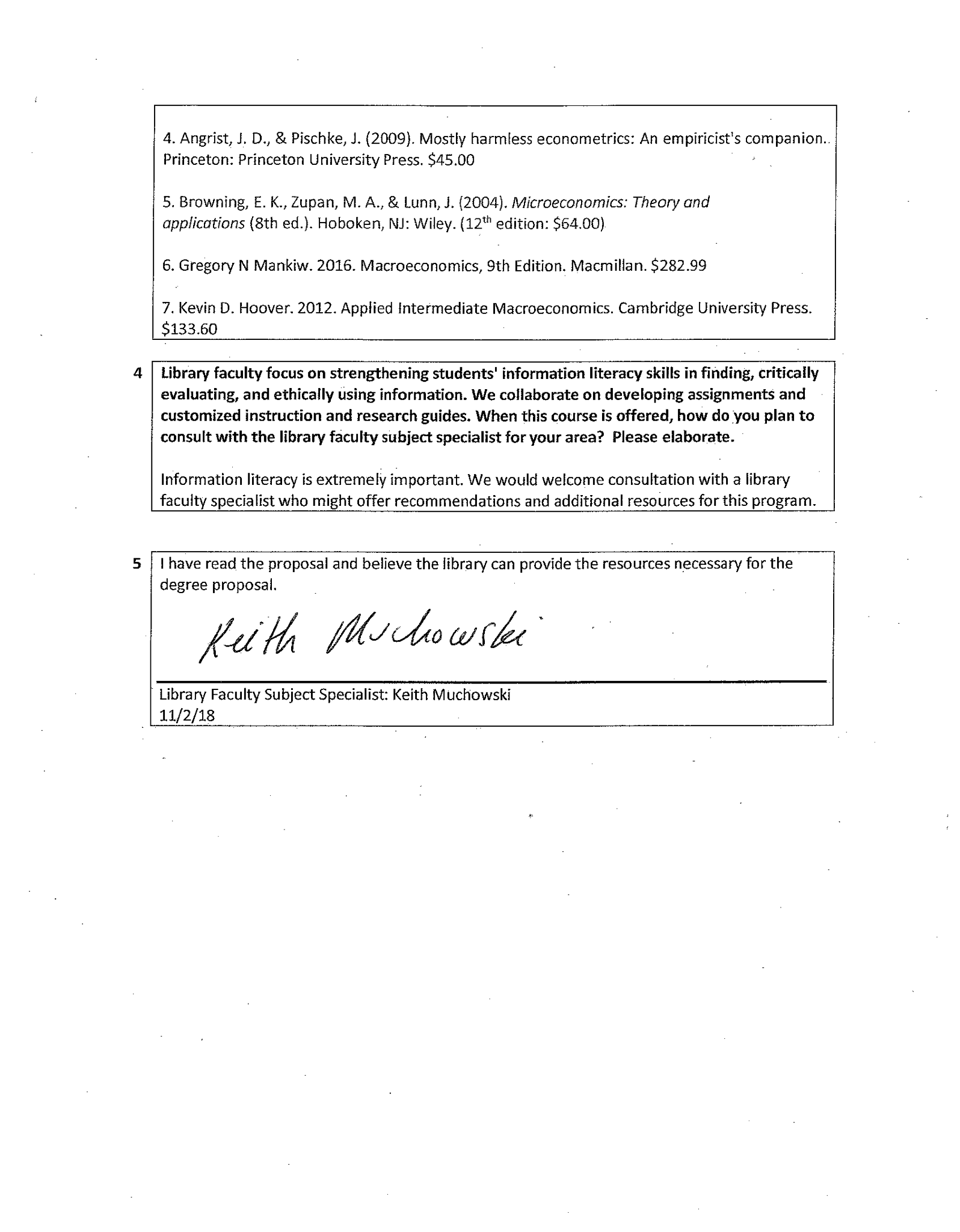
shan@citytech.cuny.edu

https://webmail.citytech.cuny.edu/owa/#path=/mail/search/rp 2/3

# Appendix C -- Library Form

**LIBRARY RESOURCES & INFORMATION LITERACY: MAJOR CURRICULUM MODIFICATION**

****



# Appendix D -- New Course Proposals

## D.1 ECON 2201 Introductory Econometrics

**ECON 2201**: Introductory Econometrics

CURRICULUM MODIFICATION PROPOSAL FORM

This form is used for all curriculum modification proposals. See the [Proposal Classification Chart](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Proposal_Classification_Chart.pdf) for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.

|  |  |
| --- | --- |
| **Title of Proposal** | ECON 2201 Introductory Econometrics |
| **Date** | August 28, 2018 |
| **Major or Minor** | Major |
| **Proposer’s Name** | Unurjargal Nyambuu |
| **Department** | Social Science |
| **Date of Departmental Meeting in which proposal was approved** | November 1, 2018 |
| **Department Chair Name** | Peter Parides |
| **Department Chair Signature and Date** | Chair approved this as part of overall proposal |
| **Academic Dean Name** | Justin Vazquez-Poritz |
| **Academic Dean Signature and Date** | Picture 4 1/27/19 |
| **Brief Description of Proposal**  (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body. | This proposal provides the justification for developing ECON 2201 as a required course in the Data Analytics – Economics program in the Department of Social Science. |
| **Brief Rationale for Proposal**  (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body). | This course provides a foundation in econometric methods, i.e., the basic skills that students need to conduct empirical data analysis. It covers a wide range of issues in the field of economics which shows how the learned techniques apply to real-world problems. Topics include simple and multiple regression analysis with cross-sectional and time-series data. In particular, the course covers ordinary least squares estimation, statistical inference, prediction, goodness-of-fit, heteroskedasticity, serial autocorrelation, and the Central Limit Theorem. In addition, survey research and its sampling methods and practical implementation are discussed. With the skills that the students acquire in this course, they will be able to test economic theories and conduct policy analysis and program evaluation using a statistical software packages such as R and Stata. The course requires a solid background in college algebra, and probability and statistics. It will complement the Data Analytics – Economics program in the Social Science Department and will be required for students in that major. |
| **Proposal History**  (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list). | This is a first submission. |

**ALL PROPOSAL CHECK LIST**

|  |  |
| --- | --- |
| Completed CURRICULUM MODIFICATION FORM including: |  |
| * Brief description of proposal | X |
| * Rationale for proposal | X |
| * Date of department meeting approving the modification | X |
| * Chair’s Signature | X |
| * Dean’s Signature | X |
| Evidence of consultation with affected departments  List of the programs that use this course as required or elective, and courses that use this as a prerequisite. | X |
| Documentation of Advisory Commission views (if applicable). | N/A |
| Completed [Chancellor’s Report Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Chancellor_Report_Quick_Reference_Guide1.doc). | X |

**EXISTING PROGRAM MODIFICATION PROPOSALS**

|  |  |
| --- | --- |
| Documentation indicating core curriculum requirements have been met for new programs/options or program changes. |  |
| Detailed rationale for each modification (this includes minor modifications) |  |

New York City College of Technology, CUNY

NEW COURSE PROPOSAL FORM

This form is used for all new course proposals. Attach this to the [Curriculum Modification Proposal Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-10-Curriculum_Modification_Proposal_Form.docx) and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

|  |  |
| --- | --- |
| **Course Title** | Introductory Econometrics |
| **Proposal Date** | August 28, 2018 |
| **Proposer’s Name** | Unurjargal Nyambuu |
| **Course Number** | ECON 2201 |
| **Course Credits, Hours** | 3 credits, 2 lecture hours, 2 lab hours |
| **Course Pre / Co-Requisites** | ECON 1101 or ECON 1401, MAT 1372 |
| **Catalog Course Description** | This course introduces the theoretical foundations of econometrics and empirical methods used for data analysis in economics. Techniques for estimating econometric models including simple and multiple regression analysis with cross-sectional data are discussed and hypotheses tests are conducted. Covered topics are ordinary least squares estimation, the Gauss-Markov theorem, statistical inference, prediction, goodness-of-fit, heteroskedasticity, serial autocorrelation, and the Central Limit Theorem. Time series analysis is studied at an introductory level. Discusses survey sampling methods and practical implementation. The focus is on empirical applications. |
| **Brief Rationale**  Provide a concise summary of why this course is important to the department, school or college. | This course provides a foundation in econometric methods, i.e., the basic skills that students need to conduct empirical data analysis. It covers a wide range of issues in the field of economics which shows how the learned techniques apply to real-world problems. Topics include simple and multiple regression analysis with cross-sectional and time-series data. In particular, the course covers ordinary least squares estimation, statistical inference, prediction, goodness-of-fit, heteroskedasticity, serial autocorrelation, and the Central Limit Theorem. In addition, survey research and its sampling methods and practical implementation will be discussed. With the skills that the students acquire in this course, they will be able to test economic theories and conduct policy analysis and program evaluation using a statistical software packages such as R and Stata. The course requires a solid background in college algebra, and probability and statistics. It will complement the Data Analytics – Economics program in the Social Science Department and will be required for students in that major. |
| **CUNY – Course Equivalencies**  Provide information about equivalent courses within CUNY, if any. | Similar courses are offered at other CUNY colleges including:  Baruch: ECO 4000 Introductory Econometrics for Economics and Finance  City: ECO 33150 Introduction to Econometrics  Hunter: ECO 32100 Introduction to Econometrics  Queens: ECON 382 Introduction to Econometrics |
| **Intent to Submit as Common Core**  If this course is intended to fulfill one of the requirements in the common core, then indicate which area. | No |
| **For Interdisciplinary Courses:**   * Date submitted to ID Committee for review * Date ID recommendation received   - Will all sections be offered as ID? Y/N | N/A |
|  |
|  |
| **Intent to Submit as a Writing Intensive Course** | N/A |

**NEW COURSE PROPOSAL CHECK LIST**

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

|  |  |
| --- | --- |
| **Completed NEW COURSE PROPOSAL FORM** |  |
| * Title, Number, Credits, Hours, Catalog course description | X |
| * Brief Rationale | X |
| * CUNY – Course Equivalencies | X |
| Completed [Library Resources and Information Literacy Form](https://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/curriculum_modification_library_form-rev3F16.doc) | X |
| **Course Outline**  Include within the outline the following. |  |
| Hours and Credits for Lecture and Labs  If hours exceed mandated Carnegie Hours, then rationale for this | X |
| Prerequisites/Co- requisites | X |
| Detailed Course Description | X |
| Course Specific Learning Outcome and Assessment Tables   * Discipline Specific * General Education Specific Learning Outcome and Assessment Tables | X |
| Example Weekly Course outline | X |
| Grade Policy and Procedure | X |
| Recommended Instructional Materials (Textbooks, lab supplies, etc) | X |
| Library resources and bibliography | X |
| **Course Need Assessment.**  Describe the need for this course. Include in your statement the following information. |  |
| Target Students who will take this course. Which programs or departments, and how many anticipated?  Documentation of student views (if applicable, e.g. non-required elective). | X |
| Projected headcounts (fall/spring and day/evening) for each new or modified course. | X |
| If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction. | X |
| Where does this course overlap with other courses, both within and outside of the department? | X |
| Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this? | X |
| If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need. | N/A |
| **Course Design**  Describe how this course is designed. |  |
| Course Context (e.g. required, elective, capstone) | X |
| Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)? | X |
| Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture) | X |
| How does this course support Programmatic Learning Outcomes? | X |
| Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program. | N/A |
| **Additional Forms for Specific Course Categories** |  |
| [Interdisciplinary Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/Application-for-Interdisciplinary-Course-Designation.docx) (if applicable) | N/A |
| Interdisciplinary Committee Recommendation (if applicable and if received)\*  \*Recommendation must be received before consideration by full Curriculum Committee | N/A |
| [Common Core (Liberal Arts) Intent to Submit](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/CommonCoreCourseSubmissionForm_4.2.12.doc) (if applicable) | N/A |
| Writing Intensive Form if course is intended to be a WIC (under development) | N/A |
| If course originated as an experimental course, then results of evaluation plan as developed with director of assessment. | N/A |
| **(Additional materials for [Curricular Experiments](http://www.300jaystreet.com/college-council/curriculum_proposals/curricular-experiments))** |  |
| Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information). |  |
| Established Timeline for Curricular Experiment |  |

**Proposed Course Name: Introductory Econometrics**

**Course Overview & Rationale**

This is an introductory level econometrics course that provides the theoretical foundation in econometric methods and basic skills needed to conduct empirical data analysis. It emphasizes empirical applications and presents methodology required to understand much economic research. Covering a wide range of issues in the field of economics, students learn to apply a multiplicity of techniques to real-world problems. Topics include simple and multiple regression analysis with cross-sectional and time-series data. In particular, the course covers ordinary least squares estimation, statistical inference, prediction, goodness of fit, heteroskedasticity, serial autocorrelation, and the Central Limit Theorem. Furthermore, time series analysis will be studied at the introductory level. In addition, sampling methods used in survey research and practical implementation will be discussed. With the skills that the students acquire in this course, they will be able to test economic theories and conduct policy analysis and program evaluation using a statistical software package, e.g., R and Stata. The course requires a solid background in college algebra, and basic concepts in probability and statistics that students have learned in core courses. This course will have lecture and lab sessions. The lectures will equip students with theoretical knowledge and the techniques necessary to conduct empirical analysis; the lab sessions will give students the opportunity to apply econometric tools to real-world problems. The course is integral to the proposed Bachelor of Science in Data Analytics – Economics program of the Social Science department.

**Course need**: Students who would take this class: this is a required course for students who intend to major in Data Analytics in Economics.

**Department:** Social Science

**Program**: Bachelor of Science in Data Analytics/Economics

**The number of section (s) anticipated**: one section for the third year

**Projected headcount**: 20 students

**Physical resources required**: For the lecture, it needs a basic smart room set**-**up**:** a screen, and an overhead projector/a TV set that is run by and connected to a computer, but the computer needs to have R and/or Stata software installed. Computer labs will need computers with these software installed.

**Course overlap**: Certain CST or MAT courses may be using R software; but the topics covered, methods taught, and examples will be different; this course focuses on economic cross-sectional and time-series data and its analysis.

**Faculty qualified for teaching this course**: Yes, there are faculty members who are qualified to teach this course.

**Course design**

**Course context**: This course will be required of students in the Data Analytics/Economics major. Students are required to complete homework assignments, work in group for certain assignments, and take midterm and final exams.

**Course structure**: This course will have lecture and lab sessions.

**Anticipated pedagogical strategies and instructional design**: This course will have lecture and lab sessions. The lectures will equip students with theoretical knowledge and the techniques necessary to conduct empirical analysis; the lab sessions will give students the opportunity to apply econometric tools to real-world problems. The lectures will provide the theoretical foundation and environment to discuss critical issues in macroeconomics. Creative in-class activities and discussions will be organized. In the lab sessions, students will collect cross-sectional and time-series data and conduct empirical analysis using software such as R and/or Stata.

**Providing support to programmatic learning outcomes**: This course requires satisfactory completion of homework assignments, work in group for certain assignments, midterm and final exams.

NEW YORK CITY COLLEGE OF TECHNOLOGY

The City University of New York

Department of Social Science

ECON 2201 (2 Class Hours, 2 Lab Hours, 3 Credits)

Introductory Econometrics

ECON 2201: Introductory Econometrics

PREREQUISITE: ECON 1101 or ECON 1401, MAT 1372

**CATALOG DESCRIPTION:**This course introduces the theoretical foundations of econometrics and empirical methods used for data analysis in economics. Techniques for estimating econometric models including simple and multiple regression analysis with cross-sectional data are discussed and hypotheses tests are conducted. Covered topics are ordinary least squares estimation, the Gauss-Markov theorem, statistical inference, prediction, goodness-of-fit, heteroskedasticity, serial autocorrelation, and the Central Limit Theorem. Time series analysis is studied at an introductory level. Discusses survey sampling methods and practical implementation. The focus is on empirical applications.

**COURSE TEXT:**

Jeffrey M. Wooldridge. 2012. Introductory Econometrics: A Modern Approach. 5th Edition. Cengage.

Florian Heiss. 2016. [Using R for Introductory Econometrics](http://www.urfie.net/to/amazon). (This book is built on above listed Wooldridge’s “Introductory Econometrics” and replicates examples using R software). This is available for online reading for free: <http://www.urfie.net/read.html>.

Graham Kalton. 1983. Introduction to Survey Sampling. SAGE. (This book can be substituted with a book by Steven K. Thompson. 2012. Sampling. John Wiley & Sons; full text is available through the library).

Additional reading material will be assigned. The instructor will provide students with lecture notes*.*

**STATISTICAL SOFTWARE:**

This course will use data analysis software R and/or Stata. The R is freely available from <https://www.r-project.org/>

**ONLINE DATA SOURCES:**

R software, <https://www.r-project.org/>

U.S. Bureau of Economic Analysis (BEA), <https://www.bea.gov/>

U.S. Bureau of Labor Statistics,<https://www.bls.gov/>

U.S. Census Bureau,<https://www.census.gov/en.html>

The [National Bureau of Economic Research](http://www.nber.org/data/), <http://www.nber.org/>

Federal Reserve Economic Data (FRED), <https://fred.stlouisfed.org/>

World Development Indicators by The World Bank, <https://data.worldbank.org/products/wdi>

International Financial Statistics by IMF, <https://www.imf.org/en/Data>

Data.gov [http://data.gov](http://data.gov/)

Enterprise Surveys <http://www.enterprisesurveys.org/>

**COURSE INTENDED LEARNING OUTCOMES/ASSESSMENT METHODS**

Upon completion of the course, students will be able to address the following key discipline issues:

|  |  |
| --- | --- |
| **Learning Outcomes** | **Assessment Methods** |
| Develop a theoretical background in econometrics, learn to estimate the parameters of a regression model using Ordinary Least Squares, and model and interpret relationships between parameters and variables. | Multiple choice, short answer, and numerical questions on exams; problem solving questions and problem sets with empirical analysis of data for homework; classroom discussions. |
| Learn to implement hypothesis testing for the parameters of the regression model. | Short answer questions on exams; problem sets with empirical analysis of data for homework; classroom discussions. |
| Be able to deal with the problems that arise when the Gauss-Markov assumptions do not hold. | Short answer and numerical questions on exams and for homework; classroom discussions. |
| Learn to conduct policy analysis by applying the econometric methods studied in class and assess validity of the assumptions. | Short answer and numerical questions on exams; problem sets with empirical analysis of data for homework (working in group for certain assignments). |
| Learn to implement econometric tools in the analysis of economic data using a statistical software package such as R. | Problem sets with empirical analysis of data for homework (working in group for certain assignments); classroom discussions. |
| Integrate theoretical understanding with practical problems. Work with real data and apply theories to real-world problems. | Multiple choice, short answer, and numerical questions on exams; problem solving questions and problem sets with empirical analysis of data for homework; classroom discussions. |

**GENERAL EDUCATION LEARNING OUTCOMES/ASSESSMENT METHODS**

|  |  |
| --- | --- |
| **General Education Outcomes** | **Assessment Methods** |
| **1. KNOWLEDGE:**  Develop knowledge from a range of disciplinary perspectives, and develop the ability to deepen and continue learning. | 1. Multiple choice, short answer, and numerical questions on exams; problem sets with empirical analysis of data for homework; classroom discussions. |
| **2. SKILLS:**  Develop and use the tools needed for communication, inquiry, analysis, and productive work. | 1. Exam short answer and numerical questions; classroom discussions; problem solving and problem sets with empirical analysis of data for homework. |
| **3. INTEGRATION:**  Work productively within and across disciplines. | 1. Short answer and numerical questions on exams and homework. |
| **4. VALUES, ETHICS, AND RELATIONSHIPS:**  Understand and apply values, ethics, and diverse perspectives in personal, civic, and cultural/global domains. | 1. Classroom discussions; teamwork in class and problem sets with empirical analysis of data for homework (working in group for certain assignments). |

**SCOPE OF ASSIGNMENTS**

There will be homework assignments covering numerical problem-solving as well as problem sets with empirical analysis of actual economic data during the semester (students will work in group for certain assignments); midterm exam, and final exam.

**METHOD OF EVALUATION** – elements and weight of factors determining the students’ grade

|  |  |
| --- | --- |
| Homework | 30% |
| Midterm exam | 30% |
| Final exam | 40% |
| Total | 100% |

**GRADE SCALE:**

|  |  |  |  |
| --- | --- | --- | --- |
| 93 – 100 = A  90 - 92.9 = A- | 87 - 89.9 = B+  83 - 86.9 = B  80 - 82.9 = B- | 77 - 79.9 = C+  70 - 76.9 = C | 60 - 69.9 = D  0 - 59.9 = F |

**COURSE OUTLINE:**

|  |  |  |
| --- | --- | --- |
| **Week** | **Topics** | **Assignment/reading\*** |
| 1 | **Overview and Introduction**   1. Course Outline 2. The structure of economic data 3. Causality 4. Review of probability and statistics, population and sample 5. Review of a statistical software | Wooldridge ch. 1; James et al (2013) ch. 1, ch. 2. |
| 2 | **Introduction to Survey Sampling**   1. Simple random sampling 2. Systematic sampling 3. Stratification 4. Cluster and multi-stage sampling | Kalton (1983); Thompson (2012). |
| 3 | **Sampling Methods in Survey Research**   1. Sampling with probability proportional to size 2. Two-phase sampling 3. Replicated sampling 4. Panel designs 5. Non-probability sampling | Kalton (1983); Thompson (2012). |
| 4 | **The Simple Linear Regression Model**   1. Deriving Ordinary Least Squares (OLS) estimates 2. Properties of OLS 3. Units of measurement and functional form 4. Expected values and variances of the OLS estimators | Wooldridge ch. 2; Heiss; James et al (2013) ch. 3. |
| 5 | **Multiple Linear Regression Analysis: Estimation**   1. Interpretations of OLS estimates 2. The expected value of the OLS estimators 3. The variance of the OLS Estimators 4. Efficiency of OLS: The Gauss-Markov theorem | Wooldridge ch. 3; Heiss; James et al (2013) ch. 3. |
| 6 | **Multiple Linear Regression Analysis: Inference**   1. Testing a hypothesis about a single population parameter: The *t* test 2. Confidence Intervals 3. Testing multiple linear restrictions: The *F* test | Wooldridge ch4; Heiss; James et al (2013) ch. 3. |
| 7 | Midterm Exam\*\* |  |
| 8 | **Multiple Regression Analysis: OLS Asymptotics**   1. Consistency 2. Asymptotic Normality and Large Sample Inference 3. Asymptotic Efficiency of OLS | Wooldridge ch. 5; Heiss. |
| 9 | **Multiple Regression Analysis: Further Issues**   1. Data scaling 2. Goodness-of-fit and selection of regressors 3. Functional form 4. More on goodness-of-fit and selection of regressors 5. Prediction and residual analysis | Wooldridge ch. 6; Heiss. |
| 10 | **Multiple Regression Analysis with Dummy Variables**   1. Describing qualitative information 2. Binary variables 3. Interactions involving dummy variables 4. Linear probability model | Wooldridge ch. 7; Heiss. |
| 11 | **Heteroskedasticity**   1. Consequences of Heteroskedasticity 2. Test for heteroscedasticity 3. Weighted Least Squares Estimation | Wooldridge ch. 8; Heiss. |
| 12 | **Basic Regression Analysis with Time Series Data 1**   1. The Nature of Time Series Data 2. Examples of Time Series Regression Models 3. Finite Sample Properties of OLS under Classical Assumptions | Wooldridge ch. 10; Heiss. |
| 13 | **Basic Regression Analysis with Time Series Data 2**   1. Functional Form, Dummy Variables, and Index Numbers 2. Trends and Seasonality | Wooldridge ch. 10; Heiss. |
| 14 | **Serial Correlation in Time Series Regressions**   1. Properties of OLS with Serially Correlated Errors 2. Testing for Serial Correlation 3. Correcting for Serial Correlation with Strictly Exogenous Regressors | Wooldridge ch. 12; Heiss. |
| 15 | ***Final Exam\*\**** |  |

***\*Assignment/reading is subject to change.***

***\*\*Exam dates are subject to change.***

**ACADEMIC INTEGRITY POLICY**

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

STATEMENT ON STUDENTS WITH DISABILITY:

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Center for Students Accessibility (CSA). Prior to granting a disability accommodation in this course, the instructor must receive written verification of a student’s eligibility from CSA, which is located in Room L-237 (<http://www.citytech.cuny.edu/accessibility/>). It is the student’s responsibility to initiate contact with the CSA staff and to follow the established procedures for having the accommodation notice sent to the instructor.

SELECT BIBLIOGRAPHY:

Campbell, J.Y. & N.G. Mankiw. 1990. Permanent Income, Current Income, and Consumption, Journal of Business and Economic Statistics 8, 265–279.

Davidson, R. & J.G. MacKinnon. 1981. Several Tests of Model Specification in the Presence of Alternative Hypotheses, Econometrica 49, 781–793.

Fair, R.C. 1996. Econometrics and Presidential Elections, Journal of Economic Perspectives 10(3), 89–102.

Franses, P.H. & R. Paap. 2001. Quantitative Models in Marketing Research. Cambridge: Cambridge University Press.

Friedman, B.M. & K.N. Kuttner. 1992. Money, Income, Prices, and Interest Rates, American Economic Review 82, 472–492.

Hall, R.E. 1988. The Relation between Price and Marginal Cost in U.S. Industry, Journal of Political Economy 96(5), 921–948.

Hamermesh, D. S. & J.E. Biddle. 1994. Beauty and the Labor Market, American Economic Review 84, 1174–1194.

Hines, J.R. 1996. Altered States: Taxes and the Location of Foreign Direct Investment in America, American Economic Review 86, 1076–1094.

Imbens, G. W. &J. M. Wooldridge 2007. What’s New in Econometrics? Lecture Notes, National Bureau of Economic Research Summer Institute, 2007. <http://www.nber.org/WNE/WNEnotes.pdf>

Neumark, D. & W. Wascher (1995), Minimum Wage Effects on Employment and School Enrollment, Journal of Business and Economic Statistics 13, 199–206.

Shea, J. 1993. The Input-Output Approach to Instrument Selection, Journal of Business and Economic Statistics 11, 145–155.

Peek, J. 1982. Interest Rates, Income Taxes, and Anticipated Inflation, American Economic Review 72, 980–991.

Ram, R. 1986. Government Size and Economic Growth: A New Framework and Some Evidence from Cross-Section and Time-Series Data, American Economic Review 76, 191–203.

Tsay, Ruey S. 2014. An Introduction to Analysis of Financial Data with R. New York: John Wiley & Sons.

**LIBRARY RESOURCES & INFORMATION LITERACY: MAJOR CURRICULUM MODIFICATION**

Consult with your library faculty subject specialist (<http://cityte.ch/dir>) **3 weeks before the proposal deadline**.

**Course proposer:** please complete boxes 1-4. **Library faculty subject specialist:** please complete box 5.

|  |  |  |
| --- | --- | --- |
| **1** | **Title of proposal**  ECON 2201 Introductory Econometrics | **Department/Program**  Social Science/Data Analytics-Economics |
|  | **Proposed by** (include email & phone)  Unurjargal Nyambuu [unyambuu@citytech.cuny.edu](mailto:unyambuu@citytech.cuny.edu)  Tel: 718-260-5059 | **Expected date course(s) will be offered**  Spring 2020  **# of students** 20 |

|  |  |
| --- | --- |
| **2** | **The library cannot purchase reserve textbooks for every course at the college, nor copies for all students. Consult our website (<http://cityte.ch/curriculum>) for articles and ebooks for your courses, or our open educational resources (OER) guide (<http://cityte.ch/oer>). Have you considered using a freely-available OER or an open textbook in this course?**  Textbook by Jeffrey M. Wooldridge on Introductory Econometrics: A Modern Approach (5th Edition) is required. Older editions of this textbook are acceptable. But the other books are available for free online including: Florian Heiss (2016) on “[Using R for Introductory Econometrics](http://www.urfie.net/to/amazon)” (<http://www.urfie.net/read.html>); and a full text of Steven K. Thompson (2012) on “Sampling” published by John Wiley & Sons is available through the library website. The instructor will provide students detailed lecture notes and handout material. Most of the resources/readings for the course are available to students through the library. |

|  |  |
| --- | --- |
| **3** | **Beyond the required course materials, are City Tech library resources sufficient for course assignments? If additional resources are needed, please provide format details (e.g. ebook, journal, DVD, etc.), full citation (author, title, publisher, edition, date), price, and product link.**  Yes, other resources and material can be accessed through the library. |

|  |  |
| --- | --- |
| **4** | **Library faculty focus on strengthening students' information literacy skills in finding, critically evaluating, and ethically using information. We collaborate on developing assignments and customized instruction and research guides. When this course is offered, how do you plan to consult with the library faculty subject specialist for your area? Please elaborate.**  This course requires students to search and collect data and read research articles and other related material. A workshop on how to search for different resources and how to properly cite the resources would be very helpful. |

|  |  |
| --- | --- |
| **5** | **Library Faculty Subject Specialist \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Comments and Recommendations**  **Date** |

**Chancellor’s Report Form**

|  |  |
| --- | --- |
| **Department(s)** | Social Science |
| **Academic Level** | **[ X ] Regular  [   ] Compensatory  [   ] Developmental  [   ] Remedial** |
| **Subject Area** | Data Analytics/Economics |
| **Course Prefix** | ECON |
| **Course Number** | ECON 2201 |
| **Course Title** | Introductory Econometrics |
| **Catalog Description** | This course introduces the theoretical foundations of econometrics and empirical methods used for data analysis in economics. Techniques for estimating econometric models including simple and multiple regression analysis with cross-sectional data are discussed and hypotheses tests are conducted. Covered topics are ordinary least squares estimation, the Gauss-Markov theorem, statistical inference, prediction, goodness-of-fit, heteroskedasticity, serial autocorrelation, and the Central Limit Theorem. Time series analysis is studied at an introductory level. Discusses survey sampling methods in research and practical implementation. The focus is on empirical applications. |
| **Prerequisite** | ECON 1101 or ECON 1401, MAT 1372 |
| **Corequisite** | None |
| **Pre- or corequisite** |  |
| **Credits** | 3 credits |
| **Contact Hours** | 2 class hours, 2 lab hours |
| **Liberal Arts** | **[ X ] Yes  [   ] No** |
| **Course Attribute (e.g. Writing Intensive, etc)** |  |
| **Course Applicability** | **[ X ] Major**  **[ ] Gen Ed Required [ ] Gen Ed - Flexible [ ] Gen Ed - College Option**  **[ ] English Composition [ ] World Cultures [ ] Speech**  **[ ] Mathematics [ ] US Experience in its Diversity [ ] Interdisciplinary**  **[ ] Science [ ] Creative Expression [ ] Advanced Liberal Arts**  **[ ] Individual and Society**  **[ ] Scientific World** |
| **Effective Term** | Spring 2020 |

**Rationale:** This course provides a foundation in econometric methods, i.e., the basic skills that students need to conduct empirical data analysis. It covers a wide range of issues in the field of economics which shows how the learned techniques apply to real-world problems. Topics include simple and multiple regression analysis with cross-sectional and time-series data. In particular, the course covers ordinary least squares estimation, statistical inference, prediction, goodness-of-fit, heteroskedasticity, serial autocorrelation, and the Central Limit Theorem. In addition, this course discusses sampling methods used in survey research and practical implementation. With the skills that the students acquire in this course, they will be able to test economic theories and conduct policy analysis and program evaluation using a statistical software packages such as R and Stata. The course requires a solid background in college algebra, and probability and statistics. It will complement the Data Analytics – Economics program in the Social Science Department and will be required for students in that major.

## D.2 ECON 3201 Advanced Topics in Econometrics

**New York City College of Technology, CUNY**

**CURRICULUM MODIFICATION PROPOSAL FORM**

This form is used for all curriculum modification proposals. See the [Proposal Classification Chart](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Proposal_Classification_Chart.pdf) for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.

|  |  |
| --- | --- |
| **Title of Proposal** | Advanced Topics in Econometrics |
| **Date** | August 27, 2018 |
| **Major or Minor** | Major |
| **Proposer’s Name** | Gulgun Bayaz Ozturk |
| **Department** | Social Science |
| **Date of Departmental Meeting in which proposal was approved** | November 1, 2018 |
| **Department Chair Name** | Peter Parides |
| **Department Chair Signature and Date** | Chair approved this as part of the overall proposal |
| **Academic Dean Name** | Justin Vazquez-Poritz |
| **Academic Dean Signature and Date** | Picture 7 1/27/19 |
| **Brief Description of Proposal**  (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body. | This proposal provides the justification for developing Advanced Econometrics (ECON 3201) as a required course in the Data Analytics – Economics program in the Department of Social Science. |
| **Brief Rationale for Proposal**  (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body). | This course is a continuation of introductory econometrics course, and it provides the necessary advanced skills that students would need to conduct empirical analysis in social sciences. This course will be a required course in Data Analytics/Economics program offered by the Social Science Department. |
| **Proposal History**  (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list). | This is a first submission. |

**ALL PROPOSAL CHECK LIST**

|  |  |
| --- | --- |
| Completed CURRICULUM MODIFICATION FORM including: |  |
| * Brief description of proposal | X |
| * Rationale for proposal | X |
| * Date of department meeting approving the modification | X |
| * Chair’s Signature | X |
| * Dean’s Signature | X |
| Evidence of consultation with affected departments  List of the programs that use this course as required or elective, and courses that use this as a prerequisite. | X |
| Documentation of Advisory Commission views (if applicable). | N/A |
| Completed [Chancellor’s Report Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Chancellor_Report_Quick_Reference_Guide1.doc). | X |

**EXISTING PROGRAM MODIFICATION PROPOSALS**

|  |  |
| --- | --- |
| Documentation indicating core curriculum requirements have been met for new programs/options or program changes. | N/A |
| Detailed rationale for each modification (this includes minor modifications) | N/A |

**New York City College of Technology, CUNY**

**NEW COURSE PROPOSAL FORM**

This form is used for all new course proposals. Attach this to the [Curriculum Modification Proposal Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-10-Curriculum_Modification_Proposal_Form.docx) and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

|  |  |
| --- | --- |
| **Course Title** | Advanced Topics in Econometrics |
| **Proposal Date** | August 27, 2018 |
| **Proposer’s Name** | Gulgun Bayaz Ozturk |
| **Course Number** | ECON 3201 |
| **Course Credits, Hours** | 3 credits; 2 lecture hours and 2 lab hours |
| **Course Pre / Co-Requisites** | Pre-req: ECON 2201  Pre- or Co-req: MAT 2580 |
| **Catalog Course Description** | This course teaches advanced empirical methods and provides various exercises to apply newly learned methods to real-world problems. The topics that will be covered include fixed effects and random effects models, instrumental variables estimation, limited dependent variable models and advanced time series topics such as cointegration and error correction models. With the skills that the students acquire in this course, they will be able to test economic theories and conduct policy analysis and program evaluation using a statistical software package such as R and/or Stata. The course requires a background in college algebra, basic concepts in probability and statistics, and introductory econometrics. |
| **Brief Rationale**  Provide a concise summary of why this course is important to the department, school or college. | This course is a continuation of introductory econometrics course, and it provides the necessary advanced skills that students would need to conduct empirical analysis in social sciences. This course will be a required course in Data Analytics/Economics program offered by the Social Science Department. |
| **CUNY – Course Equivalencies**  Provide information about equivalent courses within CUNY, if any. | Hunter College: ECO 724: Microeconometrics; ECO 723: Time Series and Forecasting; ECO 726: Policy and Program Evaluation  Queens College: ECON 852: Quantitative Methods  ECON 850: Econometrics |
| **Intent to Submit as Common Core**  If this course is intended to fulfill one of the requirements in the common core, then indicate which area. | No |
| **For Interdisciplinary Courses:**   * Date submitted to ID Committee for review * Date ID recommendation received   - Will all sections be offered as ID? Y/N | N/A |
|  |
|  |
| **Intent to Submit as a Writing Intensive Course** | N/A |

**NEW COURSE PROPOSAL CHECK LIST**

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

|  |  |
| --- | --- |
| **Completed NEW COURSE PROPOSAL FORM** |  |
| * Title, Number, Credits, Hours, Catalog course description | x |
| * Brief Rationale | x |
| * CUNY – Course Equivalencies | x |
| Completed [Library Resources and Information Literacy Form](https://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/curriculum_modification_library_form-rev3F16.doc) |  |
| **Course Outline**  Include within the outline the following. |  |
| Hours and Credits for Lecture and Labs  If hours exceed mandated Carnegie Hours, then rationale for this | x |
| Prerequisites/Co- requisites | x |
| Detailed Course Description | x |
| Course Specific Learning Outcome and Assessment Tables   * Discipline Specific * General Education Specific Learning Outcome and Assessment Tables | x |
| Example Weekly Course outline | x |
| Grade Policy and Procedure |  |
| Recommended Instructional Materials (Textbooks, lab supplies, etc) | x |
| Library resources and bibliography | x |
| **Course Need Assessment.**  Describe the need for this course. Include in your statement the following information. |  |
| Target Students who will take this course. Which programs or departments, and how many anticipated?  Documentation of student views (if applicable, e.g. non-required elective). | x |
| Projected headcounts (fall/spring and day/evening) for each new or modified course. | x |
| If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction. | x |
| Where does this course overlap with other courses, both within and outside of the department? | x |
| Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this? | x |
| If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need. | x |
| **Course Design**  Describe how this course is designed. |  |
| Course Context (e.g. required, elective, capstone) | x |
| Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)? | x |
| Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture) | x |
| How does this course support Programmatic Learning Outcomes? | x |
| Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program. | N/A |
| **Additional Forms for Specific Course Categories** |  |
| [Interdisciplinary Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/Application-for-Interdisciplinary-Course-Designation.docx) (if applicable) | N/A |
| Interdisciplinary Committee Recommendation (if applicable and if received)\*  \*Recommendation must be received before consideration by full Curriculum Committee |  |
| [Common Core (Liberal Arts) Intent to Submit](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/CommonCoreCourseSubmissionForm_4.2.12.doc) (if applicable) | N/A |
| Writing Intensive Form if course is intended to be a WIC (under development) | N/A |
| If course originated as an experimental course, then results of evaluation plan as developed with director of assessment. | N/A |
| **(Additional materials for [Curricular Experiments](http://www.300jaystreet.com/college-council/curriculum_proposals/curricular-experiments))** |  |
| Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information). | N/A |
| Established Timeline for Curricular Experiment | N/A |

**Proposed Course Name: Advanced Topics in Econometrics**

**Course Overview and Rationale**

Advanced topics in econometrics builds on the basic skills acquired by students in introductory econometrics course. It will continue to cover the core methods of applied econometrics needed by anyone who will be using data to shape business strategies or public policies. In addition to introducing advanced methods to handle cross-section and time-series data in applied research, the course will provide the fundamental tools of panel data econometrics, instrumental variables methods and the limited dependent variables models. This course uses a lecture/lab format where lectures provide the conceptual and theoretical foundation for each research method, and are followed by lab meetings where students practice newly learned techniques via computer exercises. Computer work plays an integral role in this course, and so students will be required to use a statistical software package (either R or Stata) to analyze economic and social data. This course will be a required course in Data Analytics/Economics program offered by the Social Science Department.

**Course Need:** Students who intend to major in Data Analytics/Economics degree program would take this class.

**Department**: Social Science Department

**Program**: Bachelor of Science in Data Analytics/Economics

**Number of section(s) anticipated**: One section for the third year.

**Projected headcount**: 20 students.

**Physical resources required:** The classroom for the lectures would need basic equipment such as a screen and a computer with statistical packages such as R, Python, Matlab and Stata. The classroom for the lab meetings would need a computer with statistical software packages mentioned above for each student in class.

**Course overlap**: None

**Faculty qualified to teach this course**: There are full and part-time faculty members with doctoral degrees who could teach this course.

**Course Design**

**Course context**: The proposed course will be a required course for students majoring in Data Analytics/Economics degree program.

**Course structure**: The proposed course is going to be composed of lectures and lab meetings.

**Anticipated Pedagogical Strategies and Instructional Design:** Various types of assessments methods will be designed to develop an understanding of econometric tools covered in class. In particular, in addition to in-class discussions, homework assignments, and exams, there will be several lab meetings where students will have the opportunity to use newly learned methods via specific computer exercises.

**Providing Support to Programmatic Learning Outcomes:** Students must perform satisfactorily on individual assignments, exams, and computer exercises to pass this course.

NEW YORK CITY COLLEGE OF TECHNOLOGY

The City University of New York

Department of Social Science

ECON 3401 (3 Class Hours, 3 Credits)

Advanced Topics in Econometrics

Pre-requisite: ECON 2201

Pre- or Co-requisite: MAT 2580

**COURSE DESCRIPTION:**

This course teaches advanced empirical methods and provides various exercises to apply newly learned methods to real-world problems. The topics that will be covered include fixed effects and random effects models, instrumental variables estimation, limited dependent variable models and advanced time series topics such as cointegration and error correction models. With the skills that the students acquire in this course, they will be able to test economic theories and conduct policy analysis and program evaluation using a statistical software package such as R and/or Stata. The course requires a background in college algebra, basic concepts in probability and statistics, and introductory econometrics.

**TEXTBOOK and COURSE MATERIALS**

Required text:

Wooldridge, Jeffrey M., 1960-. (2012). Introductory econometrics: a modern approach. Mason, Ohio: South-Western Cengage Learning.

Recommended text:

Angrist, J. D., & Pischke, J. (2009). Mostly harmless econometrics: An empiricist's companion. Princeton: Princeton University Press.

Data sources:

Bureau of Economic Analysis: <http://www.bea.gov/>

Centers for Disease Control and Prevention: <https://www.cdc.gov/>

Federal Reserve Economic Data (FRED), <https://fred.stlouisfed.org/>

The Equality of Opportunity Project: <http://www.equality-of-opportunity.org/data/>

*The* [National Bureau of Economic Research](http://www.nber.org/data/):<http://www.nber.org/>

U.S. Bureau of Labor Statistics:<https://www.bls.gov/>

U.S. Census Bureau:<https://www.census.gov/en.html>

U.S. Social Security Administration: <https://www.ssa.gov/>

**COURSE INTENDED LEARNING OUTCOMES/ASSESSMENT METHODS**

|  |  |
| --- | --- |
| Learning Outcomes | Assessment Methods |
| 1. Develop a good understanding of the core methods of applied econometrics such as panel data methods, IV estimation and advanced time-series models. | In-class discussions; computer exercises assigned during lab meetings; exams. |
| 1. Learn the data sources available to analyze various economic and social issues. | Class assignments/computer exercises during lab meetings. |
| 1. Learn to use advanced tools to analyze economic and social problems, and implement policy analysis using the econometric methods studied. | In-class assignments during lab meetings; class discussions and homework assignments. |
| 1. Learn to implement the econometric tools using a statistical software package such as R and/or Stata. | In-class assignments during lab meetings; class discussions. |

**GENERAL EDUCATION LEARNING OUTCOMES/ASSESSMENT METHODS**

|  |  |
| --- | --- |
| Learning Outcomes | Assessment methods |
| Knowledge: Develop a good understanding of the core methods of advanced econometrics that are widely used in applied social sciences. | Review of material in computer exercises; short answer questions on graded exams and assignments. |
| Skills: Develop the ability to analyze quantitative data using advanced econometric tools and statistical software packages. | Class discussions, in-class and homework assignments, exams where students apply the tools they have learned. |
| Integration: Use advanced econometric techniques to analyze various economic and social problems. | In-class assignments during lab sessions, homework assignments and exams. |
| Values, Ethics and Relationships: Develop an ability to apply diverse perspectives to the understanding of social and economic issues. | In-class assignments during lab sessions, short answer questions on graded exams. |

**SCOPE OF ASSIGNMENTS**

Students will complete readings, two exams, and a set of computer exercises during and outside lab meetings. In exams, students will be required to demonstrate a clear understanding of key methods covered in the course and the readings. In lab meetings, students will be assigned various topics where they can use data to apply newly learned econometric tools to conduct economic analysis.

**GRADE POLICY AND PROCEDURE METHOD OF GRADING**:

Elements and weight of factors determining course grade

|  |  |
| --- | --- |
| 1. Participation | 15% |
| 2. Computer Exercises | 40% |
| 3. Midterm Exam | 20% |
| 4.Final Exam | 25% |

**GRADING POLICY**

All grades will be calculated according to the college grade scale:

Letter Grade Meaning of Letter Grade Number Grade

A Exceptional 100-93

A- Superior 92.9-90

B+ Very good 89.9-87

B Good 86.9-83

B- Above Average 82.9-80

C+ Slightly Above Average 79.9-77

C Average 76.9-70

D Poor 69.9-60

F Failure 59.9-0

**ACADEMIC INTEGRITY POLICY**

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

**STATEMENT ON STUDENTS WITH DISABILITY:**

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Center for Students Accessibility (CSA). Prior to granting a disability accommodation in this course, the instructor must receive written verification of a student’s eligibility from CSA, which is located in Room L-237 (<http://www.citytech.cuny.edu/accessibility/>). It is the student’s responsibility to initiate contact with the CSA staff and to follow the established procedures for having the accommodation notice sent to the instructor.

**WEEKLY COURSE OUTLINE**

|  |  |  |
| --- | --- | --- |
| Week 1 | * Introduction * Overview of Topics covered in Introductory Econometrics class | Lecture notes  Angrist & Pischke chapters 2 and 3 |
| Week 2 | Simple Panel Data Methods:   * Pooling Cross-Sections Across Time * Two-period panel data analysis | Wooldridge chapter 13 |
| Week 3 | Advanced Panel Data Methods:   * Fixed Effects Estimation * Random Effects Models * Applying panel data methods to other data structures | Woolridge chapter 14;  Angrist & Pischke chapter 5. |
| Week 4 | Application of methods learned in Advanced Panel Data methods | Computer Exercises using data sets and a statistical software (Stata or R) |
| Week 5 | Instrumental Variable Estimation and 2SLS:   * The Selection Problem and Experimental Ideal * IV estimation of the Multiple Regression Model and Causality * 2SLS * Testing for Endogeneity and Testing Overidentifying restrictions | Woolridge chapter 15;  Angrist & Pischke chapter 4 |
| Week 6 | Application of IV estimation and 2SLS | Computer Exercises using data sets and a statistical software (Stata or R) |
| Week 7 | **Review & Midterm Exam** |  |
| Week 8 | Simultaneous Equation Models:   * Simultaneity Bias in OLS * Identifying & estimating a structural equation * Simultaneous equation models with time series and panel data | Wooldridge chapter 16 |
| Week 9 | Application of simultaneous equation models | Computer Exercises using data sets and a statistical software (Stata or R) |
| Week 10 | Limited Dependent Variable Models:   * Logit and Probit Models * The Tobit model * Poisson Regression Model * Sample Selection Corrections | Wooldridge chapter 17 |
| Week 11 | Application of Limited Dependent Variable Models | Computer Exercises using data sets and a statistical software (Stata or R) |
| Week 12 | Advanced Time Series Topics I   * Infinite Distributed Lag Models * Testing for Unit Roots * Spurious Regression | Wooldridge chapter 18 |
| Week 13 | Advanced Time Series Topics II   * Cointegration and Error Correction Models * Forecasting | Wooldridge chapter 18 |
| Week 14 | Application of Advanced Time Series Methods | Computer Exercises using data sets and a statistical software (Stata or R) |
| Week 15 | Review and Final Exam |  |

**SELECT BIBLIOGRAPHY**

Angrist, J. & Chernozhukov V., Applied Econometrics: Mostly Harmless Big Data, Fall 2014. (Massachusetts Institute of Technology: MIT OpenCouseWare), http://ocw.mit.edu (Accessed 8/31/2018). License: Creative Commons BY-NC-SA.

Cameron, A. Colin, & Trivedi, P. K. (2009). *Microeconometrics using Stata.* College Station, Tex.: Stata Press.

Chernozhukov V. & Fernandez-Val, O., Econometrics, Spring 2017. (Massachusetts Institute of Technology: MIT OpenCouseWare), http://ocw.mit.edu (Accessed 8/31/2018). License: Creative Commons BY-NC-SA.

CORE Team (2017). The Economy, Economics for a Changing World. Oxford: Oxford University Press.

Ehrenberg, R. G., & Smith, R. S. (1994). *Modern labor economics: Theory and public policy*. New York: HarperCollins College Publishers.

Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. (2013). *An introduction to statistical learning: with applications in R*. New York: Springer.

Greene, W. H. (2000). *Econometric analysis*. Upper Saddle River, N.J: Prentice Hall.

Kennedy, P. (2008). *A guide to econometrics*. Malden, MA: Blackwell Pub.

**LIBRARY RESOURCES & INFORMATION LITERACY:**

**MAJOR CURRICULUM MODIFICATION**

**Course proposer:** please complete boxes 1-4. **Library faculty subject specialist:** please complete box 5.

|  |  |  |
| --- | --- | --- |
| **1** | **Title of proposal**  Advanced Topics in Econometrics | **Department/Program**  Social Science |
|  | **Proposed by** (include email & phone)  Gulgun Bayaz Ozturk  gbayazozturk@citytech.cuny.edu | **Expected date course(s) will be offered**  Spring 2020  **# of students** 20 |

|  |  |
| --- | --- |
| **2** | **The library cannot purchase reserve textbooks for every course at the college, nor copies for all students. Consult our website (<http://cityte.ch/curriculum>) for articles and ebooks for your courses, or our open educational resources (OER) guide (<http://cityte.ch/oer>). Have you considered using a freely-available OER or an open textbook in this course?**  Textbook by Jeffrey M. Wooldridge on Introductory Econometrics: A Modern Approach (5th Edition) is required. Older editions of this textbook are acceptable. Instructors can use open educational resources that cover similar course materials. MIT OpenCourseware provides free access to high quality OERs in econometrics. However, the level of course materials are more suitable for graduate degree programs. |

|  |  |
| --- | --- |
| **3** | **Beyond the required course materials, are City Tech library resources sufficient for course assignments? If additional resources are needed, please provide format details (e.g. ebook, journal, DVD, etc.), full citation (author, title, publisher, edition, date), price, and product link.**  Yes. |

|  |  |
| --- | --- |
| **4** | **Library faculty focus on strengthening students' information literacy skills in finding, critically evaluating, and ethically using information. We collaborate on developing assignments and customized instruction and research guides. When this course is offered, how do you plan to consult with the library faculty subject specialist for your area? Please elaborate.**  Yes, other resources and material can be accessed through the library. |

|  |  |
| --- | --- |
|  | **Library Faculty Subject Specialist \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Comments and Recommendations**  **Date** |

**Chancellor’s Report Form**

|  |  |
| --- | --- |
| **Department(s)** | Social Science |
| **Academic Level** | **[ X ] Regular  [   ] Compensatory  [   ] Developmental  [   ] Remedial** |
| **Subject Area** | Data Analytics/Economics |
| **Course Prefix** | ECON |
| **Course Number** | ECON 3201 |
| **Course Title** | Advanced Topics in Econometrics |
| **Catalog Description** | This course teaches advanced empirical methods and provides various exercises to apply newly learned methods to real-world problems. The topics that will be covered include fixed effects and random effects models, instrumental variables estimation, limited dependent variable models and advanced time series topics such as cointegration and error correction models. With the skills that the students acquire in this course, they will be able to test economic theories and conduct policy analysis and program evaluation using a statistical software package such as R and/or Stata. The course requires a background in college algebra, basic concepts in probability and statistics, and introductory econometrics. |
| **Prerequisite** | ECON 2201 |
| **Corequisite** |  |
| **Pre- or corequisite** | MAT 2580 |
| **Credits** | 3 credits |
| **Contact Hours** | 2 lecture hours and 2 lab hours |
| **Liberal Arts** | **[ X ] Yes  [   ] No** |
| **Course Attribute (e.g. Writing Intensive, etc)** |  |
|  |  |
| **Course Applicability** | **[ X ] Major**  **[ ] Gen Ed Required [ ] Gen Ed - Flexible [ ] Gen Ed - College Option**  **[ ] English Composition [ ] World Cultures [ ] Speech**  **[ ] Mathematics [ ] US Experience in its Diversity [ ] Interdisciplinary**  **[ ] Science [ ] Creative Expression [ ] Advanced Liberal Arts**  **[ ] Individual and Society**  **[ ] Scientific World** |
| **Effective Term** | Spring 2020 |

**Rationale:** This course is a continuation of introductory econometrics course, and it provides the necessary advanced skills that students would need to conduct empirical analysis in social sciences. This course will be a required course in Data Analytics/Economics program offered by the Social Science Department.

## D.3 ECON 3801 Introduction to Statistical Learning

**New York City College of Technology, CUNY**

**CURRICULUM MODIFICATION PROPOSAL FORM**

This form is used for all curriculum modification proposals. See the [Proposal Classification Chart](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Proposal_Classification_Chart.pdf) for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.

|  |  |
| --- | --- |
| **Title of Proposal** | Introduction to Statistical Learning |
| **Date** | August 27, 2018 |
| **Major or Minor** | Major |
| **Proposer’s Name** | Gulgun Bayaz Ozturk |
| **Department** | Social Science |
| **Date of Departmental Meeting in which proposal was approved** | November 1, 2018 |
| **Department Chair Name** | Peter Parides |
| **Department Chair Signature and Date** | Chair approved this as part of overall proposal |
| **Academic Dean Name** | Justin Vazquez-Poritz |
| **Academic Dean Signature and Date** | Picture 10 1/27/19 |
| **Brief Description of Proposal**  (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body. | This proposal provides the justification for developing Introduction to Statistical Learning (ECON 3801) as a required course in the Data Analytics/Economics program in the Department of Social Science. |
| **Brief Rationale for Proposal**  (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body). | This course introduces statistical learning models that are most natural for economic applications. It will introduce cutting-edge statistical tools to analyze large-scale data which may not be possible with traditional econometric methods learned in ECON 2201 and ECON3201. Therefore, ECON 3801 will complement the topics covered in traditional econometrics courses by providing a toolkit that will be highly desirable by economists as the use of large-scale data to predict various economic phenomena becomes more prevalent. This course will be a required course in Data Analytics/Economics program offered by the Social Science Department. |
| **Proposal History**  (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list). | This is a first submission. |

**ALL PROPOSAL CHECK LIST**

|  |  |
| --- | --- |
| Completed CURRICULUM MODIFICATION FORM including: |  |
| * Brief description of proposal | X |
| * Rationale for proposal | X |
| * Date of department meeting approving the modification | X |
| * Chair’s Signature | X |
| * Dean’s Signature | X |
| Evidence of consultation with affected departments  List of the programs that use this course as required or elective, and courses that use this as a prerequisite. | X |
| Documentation of Advisory Commission views (if applicable). | N/A |
| Completed [Chancellor’s Report Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Chancellor_Report_Quick_Reference_Guide1.doc). | X |

**EXISTING PROGRAM MODIFICATION PROPOSALS**

|  |  |
| --- | --- |
| Documentation indicating core curriculum requirements have been met for new programs/options or program changes. | N/A |
| Detailed rationale for each modification (this includes minor modifications) | N/A |

**New York City College of Technology, CUNY**

**NEW COURSE PROPOSAL FORM**

This form is used for all new course proposals. Attach this to the [Curriculum Modification Proposal Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-10-Curriculum_Modification_Proposal_Form.docx) and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

|  |  |
| --- | --- |
| **Course Title** | Introduction to Statistical Learning |
| **Proposal Date** | August 27, 2018 |
| **Proposer’s Name** | Gulgun Bayaz Ozturk |
| **Course Number** | ECON 3801 |
| **Course Credits, Hours** | 3 credits; 2 lecture hours and 2 lab hours |
| **Course Pre / Co-Requisites** | Pre-req: ECON 3201 and CST 2402 and MAT 2580 |
| **Catalog Course Description** | This course introduces students to the primary concepts and tools of machine learning that social scientists have started to utilize with the availability of large datasets. The topics that will be covered include overfitting problem, cross-validation, penalized regression models, classification and regression trees. Students will apply off-the-shelf prediction methods to various economic and social problems using a statistical programming language such as R or Stata. This course requires a background in basic concepts in probability and statistics, standard classification models studied in advanced econometrics class, and a knowledge of matrix operations. |
| **Brief Rationale**  Provide a concise summary of why this course is important to the department, school or college. | This course introduces statistical learning models that are most natural for economic applications. It will introduce cutting-edge statistical tools to analyze large-scale data which may not be possible with traditional econometric methods learned in ECON 2201 and ECON3201. Therefore, ECON 3801 will complement the topics covered in traditional econometrics courses by providing a toolkit that will be highly desirable by economists as the use of large-scale data to predict various economic phenomena becomes more prevalent. This course will be a required course in Data Analytics/Economics program offered by the Social Science Department. |
| **CUNY – Course Equivalencies**  Provide information about equivalent courses within CUNY, if any. |  |
| **Intent to Submit as Common Core**  If this course is intended to fulfill one of the requirements in the common core, then indicate which area. | No |
| **For Interdisciplinary Courses:**   * Date submitted to ID Committee for review * Date ID recommendation received   - Will all sections be offered as ID? Y/N | N/A |
|  |
|  |
| **Intent to Submit as a Writing Intensive Course** | N/A |

**NEW COURSE PROPOSAL CHECK LIST**

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

|  |  |
| --- | --- |
| **Completed NEW COURSE PROPOSAL FORM** |  |
| * Title, Number, Credits, Hours, Catalog course description | x |
| * Brief Rationale | x |
| * CUNY – Course Equivalencies | x |
| Completed [Library Resources and Information Literacy Form](https://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/curriculum_modification_library_form-rev3F16.doc) |  |
| **Course Outline**  Include within the outline the following. |  |
| Hours and Credits for Lecture and Labs  If hours exceed mandated Carnegie Hours, then rationale for this | x |
| Prerequisites/Co- requisites | x |
| Detailed Course Description | x |
| Course Specific Learning Outcome and Assessment Tables   * Discipline Specific * General Education Specific Learning Outcome and Assessment Tables | x |
| Example Weekly Course outline | x |
| Grade Policy and Procedure |  |
| Recommended Instructional Materials (Textbooks, lab supplies, etc) | x |
| Library resources and bibliography | x |
| **Course Need Assessment.**  Describe the need for this course. Include in your statement the following information. |  |
| Target Students who will take this course. Which programs or departments, and how many anticipated?  Documentation of student views (if applicable, e.g. non-required elective). | x |
| Projected headcounts (fall/spring and day/evening) for each new or modified course. | x |
| If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction. | x |
| Where does this course overlap with other courses, both within and outside of the department? | x |
| Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this? | x |
| If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need. | x |
| **Course Design**  Describe how this course is designed. |  |
| Course Context (e.g. required, elective, capstone) | x |
| Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)? | x |
| Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture) | x |
| How does this course support Programmatic Learning Outcomes? | x |
| Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program. | N/A |
| **Additional Forms for Specific Course Categories** |  |
| [Interdisciplinary Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/Application-for-Interdisciplinary-Course-Designation.docx) (if applicable) | N/A |
| Interdisciplinary Committee Recommendation (if applicable and if received)\*  \*Recommendation must be received before consideration by full Curriculum Committee |  |
| [Common Core (Liberal Arts) Intent to Submit](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/CommonCoreCourseSubmissionForm_4.2.12.doc) (if applicable) | N/A |
| Writing Intensive Form if course is intended to be a WIC (under development) | N/A |
| If course originated as an experimental course, then results of evaluation plan as developed with director of assessment. | N/A |
| **(Additional materials for [Curricular Experiments](http://www.300jaystreet.com/college-council/curriculum_proposals/curricular-experiments))** |  |
| Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information). | N/A |
| Established Timeline for Curricular Experiment | N/A |

**Proposed Course Name: Introduction to Statistical Learning**

**Course Overview and Rationale**

It is expected that the use of machine learning methods combined with newly available datasets will transform economics and the way we tackle economic and social problems in fundamental ways. Improved software packages, by making these sophisticated tools accessible to researchers from different backgrounds, play an important role in easing the burden on their implementation. In the last couple of years, empirical economists started to apply off-the-shelf prediction methods to look at various problems such as predicting loan repayment using mobile phone data and predicting poverty, safety and home values using satellite images or street maps. Besides economic applications of prediction methodology that are readily available for economists’ use, interdisciplinary group of researchers are working together to develop machine learning algorithms to solve causal inference problems which are of primary interest to the economists.

In line with these developments, it is vital to introduce our students in the Data Analytics/Economics program to the primary concepts and tools of machine learning. This course will teach the essential predictive models that one would need when confronted with a prediction problem and lots of data. In particular, the course will cover topics such as overfitting problem, cross-validation, penalized regression models, classification and regression trees. It will use a lecture/lab format where lectures provide the conceptual and theoretical foundation for each research method, and are followed by lab meetings where students practice newly learned techniques via computer exercises. Computer work plays an integral role in this course, and so students will be required to use a statistical package R to analyze economic and social data. This course will be a required course in Data Analytics/Economics program offered by the Social Science Department.

**Course Need:** Students who intend to major in Data Analytics/Economics degree program would take this class.

**Department**: Social Science Department

**Program**: Bachelor of Science in Data Analytics/Economics

**Number of section(s) anticipated**: One section for the third year.

**Projected headcount**: 20 students.

**Physical resources required:** The classroom for the lectures would need basic equipment such as a screen and a computer with statistical packages such as R, Python, Matlab, Stata and Rapidminer. The classroom for the lab meetings would need a computer with statistical software packages mentioned above for each student in class.

**Course overlap**: None

**Faculty qualified to teach this course**: There are full and part-time faculty members with doctoral degrees who could teach this course.

**Course Design**

**Course context**: The proposed course will be a required course for students majoring in Data Analytics/Economics degree program.

**Course structure**: The proposed course is going to be composed of lectures and lab meetings.

**Anticipated Pedagogical Strategies and Instructional Design:** Various types of assessments methods will be designed to develop an understanding of statistical tools covered in class. In particular, in addition to in-class discussions, homework assignments, and exams, there will be several lab meetings where students will have the opportunity to use newly learned methods via specific computer exercises.

**Providing Support to Programmatic Learning Outcomes:** Students must perform satisfactorily on individual assignments, exams, and computer exercises to pass this course.

NEW YORK CITY COLLEGE OF TECHNOLOGY

The City University of New York

Department of Social Science

ECON 3801 (3 Class Hours, 3 Credits)

Introduction to Statistical Learning

Pre-requisite: ECON 3201 and CST 2402 and MAT 2580

**COURSE DESCRIPTION:**

This course introduces students to the primary concepts and tools of machine learning that social scientists have started to utilize with the availability of large datasets. The topics that will be covered include overfitting problem, cross-validation, penalized regression models, classification and regression trees. Students will apply off-the-shelf prediction methods to various economic and social problems using a statistical programming language such as R or Stata. This course requires a background in basic concepts of probability and statistics, standard classification models studied in advanced econometrics class and a knowledge of matrix operations.

**TEXTBOOK and COURSE MATERIALS**

Required text:

Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. (2013). *An introduction to statistical learning: with applications in R*. New York: Springer.

Data sources:

Bureau of Economic Analysis: <http://www.bea.gov/>

Centers for Disease Control and Prevention: <https://www.cdc.gov/>

Federal Reserve Economic Data (FRED), <https://fred.stlouisfed.org/>

The Equality of Opportunity Project: <http://www.equality-of-opportunity.org/data/>

The[National Bureau of Economic Research](http://www.nber.org/data/):<http://www.nber.org/>

U.S. Bureau of Labor Statistics:<https://www.bls.gov/>

U.S. Census Bureau:<https://www.census.gov/en.html>

U.S. Social Security Administration: <https://www.ssa.gov/>

**COURSE INTENDED LEARNING OUTCOMES/ASSESSMENT METHODS**

|  |  |
| --- | --- |
| Learning Outcomes |  |
| 1. Develop a good understanding of the modern statistical methods such as penalized regression models, classification and regression trees for modelling and prediction in social and behavioral sciences. | In-class discussions; computer exercises assigned during lab meetings; exams. |
| 1. Develop a good understanding of how methods of statistical learning can complement traditional econometric methods when confronted with a prediction problem. Learn about the recent developments regarding algorithms of causal inference to solve traditional social science estimation tasks. | Class assignments/computer exercises during lab meetings. |
| 1. Apply off-the-shelf prediction tools to analyze economic and social problems that will inform policy making. Develop the ability to assess the advantages and disadvantages of new tools over traditional approaches when applied to different problems. | In-class assignments during lab meetings; class discussions and homework assignments. |
| 1. Learn to implement the models using the statistical programming language R. | In-class assignments during lab meetings; class discussions. |

**GENERAL EDUCATION LEARNING OUTCOMES/ASSESSMENT METHODS**

|  |  |
| --- | --- |
| Learning Outcomes | Assessment methods |
| Knowledge: Develop a good understanding of the core methods of statistical learning that are expected to be widely used in applied social sciences. | Review of material in computer exercises;  short answer questions on graded exams and assignments. |
| Skills: Develop the ability to analyze datasets using an algorithmic approach with the help of statistical software packages. | Class discussions, in-class and homework assignments, exams where students apply the tools they have learned. |
| Integration: Use the tools of machine learning to analyze various economic and social problems. | In-class assignments during lab sessions, homework assignments and exams. |
| Values, Ethics and Relationships: Develop an ability to apply diverse perspectives to the understanding of social and economic issues. | In-class assignments during lab sessions, short answer questions on graded exams. |

**SCOPE OF ASSIGNMENTS**

Students will complete readings, two exams, and a set of computer exercises during and outside lab meetings. In exams, students will be required to demonstrate a clear understanding of key methods covered in the course and the readings. In lab meetings, students will be assigned various topics where they can use data to apply newly learned machine learning tools to conduct economic analysis.

**GRADE POLICY AND PROCEDURE METHOD OF GRADING**:

Elements and weight of factors determining course grade

|  |  |
| --- | --- |
| 1. Participation | 15% |
| 2. Computer Exercises | 40% |
| 3. Midterm Exam | 20% |
| 4.Final Exam | 25% |

**GRADING POLICY**

All grades will be calculated according to the college grade scale:

Letter Grade Meaning of Letter Grade Number Grade

A Exceptional 100-93

A- Superior 92.9-90

B+ Very good 89.9-87

B Good 86.9-83

B- Above Average 82.9-80

C+ Slightly Above Average 79.9-77

C Average 76.9-70

D Poor 69.9-60

F Failure 59.9-0

**ACADEMIC INTEGRITY POLICY**

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

**STATEMENT ON STUDENTS WITH DISABILITY:**

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Center for Students Accessibility (CSA). Prior to granting a disability accommodation in this course, the instructor must receive written verification of a student’s eligibility from CSA, which is located in Room L-237 (<http://www.citytech.cuny.edu/accessibility/>). It is the student’s responsibility to initiate contact with the CSA staff and to follow the established procedures for having the accommodation notice sent to the instructor.

**WEEKLY COURSE OUTLINE**

|  |  |  |
| --- | --- | --- |
| Week 1 | * Introduction * Overview of classical linear methods for regression and classification: logistic regression and linear discriminant analysis | James et al. chapters 3 and 4 |
| Week 2 | * Basic terminology and key concepts in statistical learning * K-nearest neighbor classifier | James et al. chapter 2 |
| Week 3 | Choosing the best method for a given application   * Cross-validation * Bootstrap | James et al. chapter 5.1, 5.2 |
| Week 4 | Lab: Cross-validation and Bootstrap | James et al. chapter 5.1, 5.2 |
| Week 5 | More on linear methods and improvements over standard regression-Shrinkage Methods   * Stepwise selection * Ridge regression * The Lasso | James et al. chapter 6.1, 6.2 |
| Week 6 | Lab: Subset Selection Methods | Computer Exercises using data sets and a statistical software (R): James et al. 6.6 |
| Week 7 | More on linear methods and improvements over standard regression-Dimension Reduction Methods   * Principal Components Regression * Partial Least Squares | James et al. chapter 6.3 |
| Week 8 | Application of methods learned in week 7 | Computer Exercises using data sets and a statistical software (R); James et al. chapter 6.7 |
| Week 8 | **Review & Midterm Exam** |  |
| Week 9 | Nonlinear Statistical Learning I:   * Basics of Decision Trees | James et al. chapter 8.1 |
| Week 10 | Lab: Decision Trees | Computer Exercises using data sets and a statistical software (Stata or R); James et al. chapter 8.3 |
| Week 11 | Nonlinear Statistical Learning II:   * Bagging * Random Forests * Boosting | James et al. chapter 8.2 |
| Week 12 | Lab: Decision Trees | Computer Exercises using data sets and a statistical software (Stata or R); James et al. 8.3 |
| Week 13 | Unsupervised Learning   * Principal Components Analysis * Clustering methods | James et al. chapter 10.1, 10.2 and 10.3 |
| Week 14 | Lab: Principal Components Analysis  Clustering methods | James et al. chapter 10.4, 10.5, 10.6 |
| Week 15 | Review and Final Exam |  |

**SELECT BIBLIOGRAPHY**

Athey, S. Beyond prediction: Using big data for policy problems. (2017) Science, 355(6324):483–485.

Angrist, J. & Chernozhukov V., Applied Econometrics: Mostly Harmless Big Data, Fall 2014. (Massachusetts Institute of Technology: MIT OpenCouseWare), http://ocw.mit.edu (Accessed 8/31/2018). License: Creative Commons BY-NC-SA.

Angrist, J. D., & Pischke, J. (2009). Mostly harmless econometrics: An empiricist's companion. Princeton: Princeton University Press.

Athey, S. and G. W. Imbens. (2017) The state of applied econometrics: Causality and policy evaluation. The Journal of Economic Perspectives, 31(2):3–32.

Belloni, A. and V. Chernozhukov, and C. Hansen. (2014) High-dimensional methods and inference on structural and treatment eﬀects. The Journal of Economic Perspectives, 28(2):29–50.

Belloni, Alexandre, Victor Chernozhukov, et al. "[Inference for High-dimensional Sparse Econometric Models](http://arxiv.org/abs/1201.0220)." Econometric Society World Congress, 2011, arXiv preprint arXiv:1201.0220.

Chernozhukov V. & Fernandez-Val, O., Econometrics, Spring 2017. (Massachusetts Institute of Technology: MIT OpenCouseWare), http://ocw.mit.edu (Accessed 8/31/2018). License: Creative Commons BY-NC-SA.

Chernozhukov, V., and Hansen, C. "Econometrics of High-Dimensional Sparse Models." NBER Lectures and Video Materials. Accessed June 22, 2015. [http://www.nber.org/econometric s\_minicourse\_2013/](http://www.nber.org/econometrics_minicourse_2013/).

CORE Team (2017). The Economy, Economics for a Changing World. Oxford: Oxford University Press.

Gentzkow, M., and J. Shapiro. "Nuts and Bolts: Computing with Large Data." NBER Lecture and Videos. Accessed June 22, 2015.  [http://www.nber.org/econometric s\_minicourse\_2013/](http://www.nber.org/econometrics_minicourse_2013/)

Varian, H. R.. Big data: New tricks for econometrics. The Journal of Economic Perspectives, 28 (2):3–27, 2014.

Wooldridge, Jeffrey M., 1960-. (2012). Introductory econometrics: a modern approach. Mason, Ohio: South-Western Cengage Learning.

**LIBRARY RESOURCES & INFORMATION LITERACY:**

**MAJOR CURRICULUM MODIFICATION**

**Course proposer:** please complete boxes 1-4. **Library faculty subject specialist:** please complete box 5.

|  |  |  |
| --- | --- | --- |
| **1** | **Title of proposal**  Introduction to Statistical Learning | **Department/Program**  Social Science |
|  | **Proposed by** (include email & phone)  Gulgun Bayaz Ozturk  gbayazozturk@citytech.cuny.edu | **Expected date course(s) will be offered**  Spring 2020  **# of students** 20 |

|  |  |
| --- | --- |
| **2** | **The library cannot purchase reserve textbooks for every course at the college, nor copies for all students. Consult our website (<http://cityte.ch/curriculum>) for articles and ebooks for your courses, or our open educational resources (OER) guide (<http://cityte.ch/oer>). Have you considered using a freely-available OER or an open textbook in this course?**  The library has the electronic version of the required textbook titled “An Introduction to Statistical Learning with Applications in R”. So, students can freely access the textbook via City Tech Library website. |

|  |  |
| --- | --- |
| **3** | **Beyond the required course materials, are City Tech library resources sufficient for course assignments? If additional resources are needed, please provide format details (e.g. ebook, journal, DVD, etc.), full citation (author, title, publisher, edition, date), price, and product link.**  Yes. |

|  |  |
| --- | --- |
| **4** | **Library faculty focus on strengthening students' information literacy skills in finding, critically evaluating, and ethically using information. We collaborate on developing assignments and customized instruction and research guides. When this course is offered, how do you plan to consult with the library faculty subject specialist for your area? Please elaborate.**  Students may need help to locate various sources of data to practice big data techniques learned in the classroom. It may be helpful to have a list of data sources that students can use when needed. |

|  |  |
| --- | --- |
| **5** | **Library Faculty Subject Specialist \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Comments and Recommendations**  **Date** |

**Chancellor’s Report Form**

|  |  |
| --- | --- |
| **Department(s)** | Social Science |
| **Academic Level** | **[ X ] Regular  [   ] Compensatory  [   ] Developmental  [   ] Remedial** |
| **Subject Area** | Data Analytics/Economics |
| **Course Prefix** | ECON |
| **Course Number** | ECON 3801 |
| **Course Title** | Introduction to Statistical Learning |
| **Catalog Description** | This course introduces students to the primary concepts and tools of machine learning that social scientists have started to utilize with the availability of large datasets. The topics that will be covered include overfitting problem, cross-validation, penalized regression models, classification and regression trees. Students will apply the off-the-shelf prediction methods to various economic and social problems using a statistical programming language such as R or Stata. This course requires a background in basic concepts of probability and statistics, standard classification models studied in advanced econometrics class and a knowledge of matrix operations. |
| **Prerequisite** | ECON 3201 and CST 2402 and MAT 2580 |
| **Corequisite** |  |
| **Pre- or corequisite** |  |
| **Credits** | 3 credits |
| **Contact Hours** | 2 lecture hours and 2 lab hours |
| **Liberal Arts** | **[ X ] Yes  [   ] No** |
| **Course Attribute (e.g. Writing Intensive, etc)** |  |
| **Course Applicability** | **[ X ] Major**  **[ ] Gen Ed Required [ ] Gen Ed - Flexible [ ] Gen Ed - College Option**  **[ ] English Composition [ ] World Cultures [ ] Speech**  **[ ] Mathematics [ ] US Experience in its Diversity [ ] Interdisciplinary**  **[ ] Science [ ] Creative Expression [ ] Advanced Liberal Arts**  **[ ] Individual and Society**  **[ ] Scientific World** |
| **Effective Term** | Spring 2020 |

**Rationale:** This course introduces statistical learning models that are most natural for economic applications. It will introduce cutting-edge statistical tools to analyze large-scale data which may not be possible with traditional econometric methods learned in ECON 2201 and ECON3201. Therefore, ECON 3801 will complement the topics covered in traditional econometrics courses by providing a toolkit that will be highly desirable by economists as the use of large-scale data to predict various economic phenomena becomes more prevalent. This course will be a required course in Data Analytics/Economics program offered by the Social Science Department.

## D.4 ECON 2401 Intermediate Microeconomics

**New York City College of Technology, CUNY**

**CURRICULUM MODIFICATION PROPOSAL FORM**

|  |  |
| --- | --- |
| **Title of Proposal** | Intermediate Microeconomics |
| **Date** | August 27, 2018 |
| **Major or Minor** | Major |
| **Proposer’s Name** | Gulgun Bayaz Ozturk |
| **Department** | Social Science |
| **Date of Departmental Meeting in which proposal was approved** | November 1, 2018 |
| **Department Chair Name** | Peter Parides |
| **Department Chair Signature and Date** | Chair approved this as part of overall proposal. |
| **Academic Dean Name** | Justin Vazquez-Poritz |
| **Academic Dean Signature and Date** | Picture 13 1/27/19 |
| **Brief Description of Proposal**  (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body. | This proposal provides the justification for developing ECON 2401 as a required course in the Data Analytics/Economics program in the Department of Social Science. |
| **Brief Rationale for Proposal**  (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body). | This course revisits and extends the topics covered in introductory microeconomics course to analyze them at a deeper and more rigorous level. Gaining a solid theoretical foundation in economic theory will provide the conceptual framework that the students would need when working with large and complex bodies of data in applied courses of the Data Analytics/Economics program offered by the Social Science Department. |
| **Proposal History**  (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list). | This is a first submission. |

**ALL PROPOSAL CHECK LIST**

|  |  |
| --- | --- |
| Completed CURRICULUM MODIFICATION FORM including: |  |
| * Brief description of proposal | X |
| * Rationale for proposal | X |
| * Date of department meeting approving the modification | X |
| * Chair’s Signature | X |
| * Dean’s Signature | X |
| Evidence of consultation with affected departments  List of the programs that use this course as required or elective, and courses that use this as a prerequisite. | X |
| Documentation of Advisory Commission views (if applicable). | N/A |
| Completed [Chancellor’s Report Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Chancellor_Report_Quick_Reference_Guide1.doc). | X |

**EXISTING PROGRAM MODIFICATION PROPOSALS**

|  |  |
| --- | --- |
| Documentation indicating core curriculum requirements have been met for new programs/options or program changes. | N/A |
| Detailed rationale for each modification (this includes minor modifications) | N/A |

**New York City College of Technology, CUNY**

**NEW COURSE PROPOSAL FORM**

This form is used for all new course proposals. Attach this to the [Curriculum Modification Proposal Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-10-Curriculum_Modification_Proposal_Form.docx) and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

|  |  |
| --- | --- |
| **Course Title** | Intermediate Microeconomics |
| **Proposal Date** | August 27, 2018 |
| **Proposer’s Name** | Gulgun Bayaz Ozturk |
| **Course Number** | ECON 2401 |
| **Course Credits, Hours** | 3 |
| **Course Pre / Co-Requisites** | ECON 1401 and MAT 2675 |
| **Catalog Course Description** | This course provides fundamental conceptual and methodological foundations of microeconomic theory at a greater depth and more rigorous manner than in introductory principles courses. Microeconomics analyzes the behavior of fundamental decision makers in a society such as consumers, workers, savers, firms, managers, individual industries and markets. It looks at the factors that influence the choice of individual decision makers and how they interact to determine the working of broader economic systems. |
| **Brief Rationale**  Provide a concise summary of why this course is important to the department, school or college. | This course revisits and extends the topics covered in introductory microeconomics course to analyze them at a deeper and more rigorous level. Gaining a solid theoretical foundation in economic theory will provide the conceptual framework that the students would need when working with large and complex bodies of data in applied courses of the Data Analytics/Economics program offered by the Social Science Department. |
| **CUNY – Course Equivalencies**  Provide information about equivalent courses within CUNY, if any. | Baruch: ECO 3100 Intermediate Microeconomics  City College: ECO 20250 Intermediate Microeconomics  Hunter: ECO 30000 Intermediate Macroeconomics  York: ECON 200 Intermediate Macroeconomics |
| **Intent to Submit as Common Core**  If this course is intended to fulfill one of the requirements in the common core, then indicate which area. | N/A |
| **For Interdisciplinary Courses:**   * Date submitted to ID Committee for review * Date ID recommendation received   - Will all sections be offered as ID? Y/N | N/A |
|  |
|  |
| **Intent to Submit as a Writing Intensive Course** | N/A |

**NEW COURSE PROPOSAL CHECK LIST**

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

|  |  |
| --- | --- |
| **Completed NEW COURSE PROPOSAL FORM** |  |
| * Title, Number, Credits, Hours, Catalog course description | X |
| * Brief Rationale | X |
| * CUNY – Course Equivalencies | X |
| Completed [Library Resources and Information Literacy Form](https://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/curriculum_modification_library_form-rev3F16.doc) | X |
| **Course Outline**  Include within the outline the following. |  |
| Hours and Credits for Lecture and Labs  If hours exceed mandated Carnegie Hours, then rationale for this | X |
| Prerequisites/Co- requisites | X |
| Detailed Course Description | X |
| Course Specific Learning Outcome and Assessment Tables   * Discipline Specific * General Education Specific Learning Outcome and Assessment Tables | X |
| Example Weekly Course outline | X |
| Grade Policy and Procedure | X |
| Recommended Instructional Materials (Textbooks, lab supplies, etc) | X |
| Library resources and bibliography | X |
| **Course Need Assessment.**  Describe the need for this course. Include in your statement the following information. |  |
| Target Students who will take this course. Which programs or departments, and how many anticipated?  Documentation of student views (if applicable, e.g. non-required elective). | X |
| Projected headcounts (fall/spring and day/evening) for each new or modified course. | X |
| If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction. | N/A |
| Where does this course overlap with other courses, both within and outside of the department? | X |
| Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this? | X |
| If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need. | N/A |
| **Course Design**  Describe how this course is designed. |  |
| Course Context (e.g. required, elective, capstone) | X |
| Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)? | X |
| Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture) | X |
| How does this course support Programmatic Learning Outcomes? | X |
| Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program. | N/A |
| **Additional Forms for Specific Course Categories** |  |
| [Interdisciplinary Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/Application-for-Interdisciplinary-Course-Designation.docx) (if applicable) | N/A |
| Interdisciplinary Committee Recommendation (if applicable and if received)\*  \*Recommendation must be received before consideration by full Curriculum Committee | N/A |
| [Common Core (Liberal Arts) Intent to Submit](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/CommonCoreCourseSubmissionForm_4.2.12.doc) (if applicable) | N/A |
| Writing Intensive Form if course is intended to be a WIC (under development) | N/A |
| If course originated as an experimental course, then results of evaluation plan as developed with director of assessment. | N/A |
| **(Additional materials for [Curricular Experiments](http://www.300jaystreet.com/college-council/curriculum_proposals/curricular-experiments))** |  |
| Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information). | N/A |
| Established Timeline for Curricular Experiment | N/A |

**Proposed Course Name: Intermediate Microeconomics**

**Course Overview & Rationale**

This course revisits and extends the topics covered in introductory microeconomics course, and provides a solid theoretical foundation which will be used in applied courses offered by the Data Analytics/Economics program at the Social Science Department. In particular, it will cover consumer choice theory, profit maximization model of the firm, market interactions through consumer demand and firm supply, different market structures, market failures, and a brief introduction to strategic decision making and game theoretic approach. In the age of big data, it has become vital to have a sound understanding of economic theory to put a conceptual framework when studying high volumes of unstructured data. Therefore, in contrast to what some believe big data does not undermine the role of economic theory, but it actually needs the simplifying framework that the theory facilitates in the analysis of large and complex data sets. Moreover, economic theory will also benefit from richer data through better tests of existing models and theories.

**Course Need:** Students who intend to major in Data Analytics/Economics degree program would take this class.

**Department**: Social Science Department

**Program**: Bachelor of Science in Data Analytics/Economics

**Number of sections anticipated**: One section for the third year.

**Projected headcount**: 20 students.

**Course overlap**: None.

**Faculty qualified to teach this course**: There are full and part-time faculty members with doctoral degrees who could teach this course.

**Course Design**

**Course context**: The proposed course will be a required course in Data Analytics/Economics degree program.

**Course structure**: The proposed course is going to be composed of lectures.

**Anticipated Pedagogical Strategies and Instructional Design:** The goal of microeconomic theory is to introduce the standard models of decision making by individual economic agents. Various types of assessments methods will be designed to develop an understanding of the fundamental concepts in microeconomic theory and how it can be used to understand individual decision making in different spheres of life. In particular, there will be in-class discussions and hypothetical experiments along with homework assignments and exams.

**Providing Support to Programmatic Learning Outcomes:** Students must perform satisfactorily on individual assignments and three major exams.

NEW YORK CITY COLLEGE OF TECHNOLOGY

The City University of New York

Department of Social Science

ECON 2401 (3 Class Hours, 3 Credits)

Intermediate Microeconomics

ECON 2401: Intermediate Microeconomics

Pre-requisite: ECON 1401 and MAT 2675

**CATALOG DESCRIPTION**

This course provides fundamental conceptual and methodological foundations of microeconomic theory at a greater depth and more rigorous manner than in introductory principles courses. Microeconomics focuses on consumer choice theory, firm theory, partial equilibrium analysis of pricing in different market structures, welfare and market imperfections. It looks at the factors that influence the choice of individual decision makers and how they interact to determine the working of broader economic systems.

**TEXTBOOK AND COURSE MATERIALS**

Varian, H. R. (2010). *Intermediate microeconomics: A modern approach* (any edition). New York: W.W. Norton & Co. Free pdf version of the textbook can be accessed online: <http://fac.ksu.edu.sa/sites/default/files/microeco-_varian.pdf>

Additional Reading:

Browning, E. K., Zupan, M. A., & Lunn, J. (2004). *Microeconomics: Theory and applications* (8th ed.). Hoboken, NJ: Wiley.

**COURSE INTENDED LEARNING OUTCOMES/ASSESSMENT METHODS**

|  |  |
| --- | --- |
| Learning Outcomes | Assessment Methods |
| 1. Learn the fundamentals of microeconomic theory such as consumption, production, market structures and market failures. | Review of material in short exercises;  multiple choice question and/or short answer question on graded exam. |
| 1. Learn microeconomic concepts used in analyzing supply, demand, market and policy issues. | Review of material in short exercises; multiple choice question and/or short-answer question on graded exam. |
| 1. Solve economic problems that involve strategic interaction between economic agents. | Review of material in short exercises;  multiple choice question and/or short answer question on graded exam. |
| 1. In addition to graphical analysis used in introductory microeconomics courses, students will learn to use algebra and calculus when studying key microeconomic models. | review of material in short exercises; multiple choice question and/or short-answer question on graded exam |
| 1. Apply microeconomic to real-world situations and analyze the effects of alternative policies on market outcomes, consumer and producer welfare. | In-class discussions of readings, review of material in short exercises and homework assignments.  Multiple choice question and/or short-answer question on graded exam |

**GENERAL EDUCATION LEARNING OUTCOMES/ASSESSMENT METHODS**

|  |  |
| --- | --- |
| Learning Outcomes | Assessment methods |
| Knowledge: To develop a solid background on microeconomic concepts. | Review of material in short exercises;  multiple choice question and/or short answer question on graded exams and assignments. |
| Skills: Develop the ability to apply microeconomic theory to unfamiliar real-world situations. | Short-answer questions in homework assignments and exams where students apply the tools they have learned. |
| Integration: Move beyond graphical analysis and use algebra and calculus to provide quantitative answers to various economic problems. | Numerical questions in homework assignments and exams. |
| Values, Ethics and Relationships: Develop an ability to apply diverse perspectives to the understanding of microeconomic issues and other related issues across disciplines. | Short-answer questions in homework assignments and exams where students apply the tools they have learned. |

**SCOPE OF ASSIGNMENTS**

Students will complete three exams, homework assignments, in-class assignments and readings. In these assignments, they will be required to demonstrate a clear understanding of key concepts covered in the lectures and the readings. They will also have the chance to conduct various applications of theories learned throughout the semester.

**METHOD OF GRADING**: elements and weight of factors determining course grade

|  |  |
| --- | --- |
| 1. Participation | 15% |
| 2. Homework Assignments | 20% |
| 3. Exam I | 20% |
| 4. Exam II | 20% |
| 5. Final Exam | 25% |

**GRADING POLICY**

All grades will be calculated according to the college grade scale:

Letter Grade Meaning of Letter Grade Number Grade

A Exceptional 100-93

A- Superior 92.9-90

B+ Very good 89.9-87

B Good 86.9-83

B- Above Average 82.9-80

C+ Slightly Above Average 79.9-77

C Average 76.9-70

D Poor 69.9-60

F Failure 59.9-0

**ACADEMIC INTEGRITY POLICY**

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

**STATEMENT ON STUDENTS WITH DISABILITY:**

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Center for Students Accessibility (CSA). Prior to granting a disability accommodation in this course, the instructor must receive written verification of a student’s eligibility from CSA, which is located in Room L-237 (<http://www.citytech.cuny.edu/accessibility/>). It is the student’s responsibility to initiate contact with the CSA staff and to follow the established procedures for having the accommodation notice sent to the instructor.

**COURSE OUTLINE**

|  |  |
| --- | --- |
| **Part I: Consumer Theory** | Week 1  The Market and an Introduction to Modeling (Chapter 1)  Budget Constraint (Chapter 2)  Math Review for general concepts (Appendix A1-A9) |
| Week 2  Preferences (Chapter 3)  Math Review-Calculus (Appendix A10-A14).  Utility (Chapter 4). |
| Week 3:  Revealed Preference (Chapter 7, skip 7.6-7.9)  Slutsky Equation (Chapter 8, skip 8.5, 8.8, 8.9) |
| Week 4  Two Applications of Choice Theory: Labor Supply and Intertemporal Choice (Sections 9.8, 9.9, 10.1-10.4) |
| **EXAM I** | Week 5  Review for the Midterm Exam.  Midterm Exam |
| **Part II: Theory of the Firm** | Week 6  Review of Midterm Exam questions  Technology (Chapter 18) |
| Week 7  Costs (Chapter 20, skip 20.2, Appendix for Chapter 20, Chapter 21) |
| Week 8  Profit Maximization (Chapter 19, skip 19.3-4, 19.9, 19.11 and 19.12)  Firm Supply under Perfect Competition (Chapter 22) |
| **Part III: Theory of the Market, Partial Equilibrium** | Week 9  Industry Supply under Perfect Competition (Chapter 23, skip 23.6-10) |
| **EXAM II** | Week 10  Review for the Exam II  Exam II |
| **Part III: Theory of the Market, Partial Equilibrium** | Week 11  Review of Midterm Exam questions  Monopoly (Chapter 24) |
| Week 12  Monopoly Behavior (Chapter 25, skip 25.7-10)  Oligopoly (Chapter 27, skip 27.3, 27.8, 27.11) |
| Week 13  Game Theory (Chapter 28) |
| **Part IV: Market Failures** | Week 14  Externalities (Chapter 34)  Public goods (Chapter 36) |
| **EXAM III** | Week 15  Review for the **Final Exam**  Final Exam |

**SELECT BIBLIOGRAPHY**

CORE Team (2017). The Economy, Economics for a Changing World. Oxford: Oxford University Press.

Gibbons, Robert, 1958-. (1992). Game theory for applied economists. Princeton, N.J.:Princeton University Press.

Gul, Faruk. "A Nobel Prize for Game Theorists: The Contributions of Harsanyi, Nash and Selten." *Journal of Economic Perspectives* (American Economic Association) 11, no. 3 (1997): 159-74.

Jehle, Geoffrey A., and Philip J. Reny. *Advanced Microeconomic Theory*. Reading, MA: Addison-Wesley, 1997. ISBN: 9780321014368.

Kahneman, Daniel, and Amos Tversky. "Prospect Theory: An Analysis of Decision Under Risk." *Econometrica* 47 (1979): 263-291.

Osborne, Martin J. *An Introduction to Game Theory*. New York, NY: Oxford University Press, 2003. ISBN: 9780195128956.

Walter Nicholson and Christopher Snyder, Intermediate Microeconomics and Its Application, 12th Edition, Thompson South-Western, Mason, Ohio, 2010.

**LIBRARY RESOURCES & INFORMATION LITERACY: MAJOR CURRICULUM MODIFICATION**

Consult with your library faculty subject specialist (<http://cityte.ch/dir>) **3 weeks before the proposal deadline**.

**Course proposer:** please complete boxes 1-4. **Library faculty subject specialist:** please complete box 5.

|  |  |  |
| --- | --- | --- |
| **1** | **Title of proposal**  ECON 2401 Intermediate Microeconomics | **Department/Program**  Social Science/Data Analytics/Economics |
|  | **Proposed by** (include email & phone)  Gulgun Bayaz Ozturk gbayazozturk@citytech.cuny.edu | **Expected date course(s) will be offered**  Spring 2020  **# of students** 20 |

|  |  |
| --- | --- |
| **2** | **The library cannot purchase reserve textbooks for every course at the college, nor copies for all students. Consult our website (<http://cityte.ch/curriculum>) for articles and ebooks for your courses, or our open educational resources (OER) guide (<http://cityte.ch/oer>). Have you considered using a freely-available OER or an open textbook in this course?**  The major resources/readings for the course are either open educational resources or are freely available to students. |

|  |  |
| --- | --- |
| **3** | **Beyond the required course materials, are City Tech library resources sufficient for course assignments? If additional resources are needed, please provide format details (e.g. ebook, journal, DVD, etc.), full citation (author, title, publisher, edition, date), price, and product link.**  The library does not have the textbook suggested for additional reading.  Browning, E. K., Zupan, M. A., & Lunn, J. (2004). *Microeconomics: Theory and applications* (8th ed.). Hoboken, NJ: Wiley. |

|  |  |
| --- | --- |
| **4** | **Library faculty focus on strengthening students' information literacy skills in finding, critically evaluating, and ethically using information. We collaborate on developing assignments and customized instruction and research guides. When this course is offered, how do you plan to consult with the library faculty subject specialist for your area? Please elaborate.**  This course may require students to read and cite research articles and other related material in their homework assignments. A workshop on how to search for different resources and how to properly cite the resources would be very helpful. |

|  |  |
| --- | --- |
| **5** | **Library Faculty Subject Specialist \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Comments and Recommendations**  **Date** |

**Chancellor’s Report Form**

|  |  |
| --- | --- |
| **Department(s)** | Social Science |
| **Academic Level** | **[ X ] Regular  [   ] Compensatory  [   ] Developmental  [   ] Remedial** |
| **Subject Area** | Data Analytics/Economics |
| **Course Prefix** | ECON |
| **Course Number** | ECON 2401 |
| **Course Title** | Intermediate Microeconomics |
| **Catalog Description** | This course provides fundamental conceptual and methodological foundations of microeconomic theory at a greater depth and more rigorous manner than in introductory principles courses. Microeconomics analyzes the behavior of fundamental decision makers in a society such as consumers, workers, savers, firms, managers, individual industries and markets. It looks at the factors that influence the choice of individual decision makers and how they interact to determine the working of broader economic systems. |
| **Prerequisite** | ECON 1401 and MAT 2675 |
| **Corequisite** | None |
| **Pre- or corequisite** |  |
| **Credits** | 3 |
| **Contact Hours** | 3 class hours |
| **Liberal Arts** | **[ X ] Yes  [   ] No** |
| **Course Attribute (e.g. Writing Intensive, etc)** |  |
| **Course Applicability** | **[ X ] Major**  **[ ] Gen Ed Required [ ] Gen Ed - Flexible [ ] Gen Ed - College Option**  **[ ] English Composition [ ] World Cultures [ ] Speech**  **[ ] Mathematics [ ] US Experience in its Diversity [ ] Interdisciplinary**  **[ ] Science [ ] Creative Expression [ ] Advanced Liberal Arts**  **[ ] Individual and Society**  **[ ] Scientific World** |
| **Effective Term** | Spring 2020 |

**Rationale:** This course revisits and extends the topics covered in introductory microeconomics course to analyze them at a deeper and more rigorous level. Gaining a solid theoretical foundation in economic theory will provide the conceptual framework that the students would need when working with large and complex bodies of data in applied courses of the Data Analytics/Economics program offered by the Social Science Department.

## D.5 ECON 2101 Intermediate Macroeconomics

**ECON 2101**: Intermediate Macroeconomics

CURRICULUM MODIFICATION PROPOSAL FORM

This form is used for all curriculum modification proposals. See the [Proposal Classification Chart](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Proposal_Classification_Chart.pdf) for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.

|  |  |
| --- | --- |
| **Title of Proposal** | ECON 2101 Intermediate Macroeconomics |
| **Date** | August 19, 2018 |
| **Major or Minor** | Major |
| **Proposer’s Name** | Unurjargal Nyambuu |
| **Department** | Social Science |
| **Date of Departmental Meeting in which proposal was approved** | November 1, 2018 |
| **Department Chair Name** | Peter Parides |
| **Department Chair Signature and Date** | Chair approved this as part of overall proposal. |
| **Academic Dean Name** | Justin Vazquez-Poritz |
| **Academic Dean Signature and Date** | Picture 16 1/27/19 |
| **Brief Description of Proposal**  (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body. | This proposal provides the justification for developing ECON 2101 as a required course in the Data Analytics – Economics program in the Department of Social Science. |
| **Brief Rationale for Proposal**  (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body). | This is an intermediate-level course on modern macroeconomic theory; thus, we study the entire US economy as well as its interactions with the global economic system. Students will learn how to analyze the economy in the short, medium, and long run, and evaluate fiscal and monetary policies. Alternative perspectives will be provided. This course builds a theoretical foundation and essential tools required for analyzing macroeconomic data and an explanation of practical problems. It will complement the Data Analytics – Economics program in the Social Science Department and will be required for students in that major. |
| **Proposal History**  (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list). | This is a first submission. |

**ALL PROPOSAL CHECK LIST**

|  |  |
| --- | --- |
| Completed CURRICULUM MODIFICATION FORM including: |  |
| * Brief description of proposal | X |
| * Rationale for proposal | X |
| * Date of department meeting approving the modification | X |
| * Chair’s Signature | X |
| * Dean’s Signature | X |
| Evidence of consultation with affected departments  List of the programs that use this course as required or elective, and courses that use this as a prerequisite. | X |
| Documentation of Advisory Commission views (if applicable). | N/A |
| Completed [Chancellor’s Report Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Chancellor_Report_Quick_Reference_Guide1.doc). | X |

**EXISTING PROGRAM MODIFICATION PROPOSALS**

|  |  |
| --- | --- |
| Documentation indicating core curriculum requirements have been met for new programs/options or program changes. |  |
| Detailed rationale for each modification (this includes minor modifications) |  |

New York City College of Technology, CUNY

NEW COURSE PROPOSAL FORM

This form is used for all new course proposals. Attach this to the [Curriculum Modification Proposal Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-10-Curriculum_Modification_Proposal_Form.docx) and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

|  |  |
| --- | --- |
| **Course Title** | Intermediate Macroeconomics |
| **Proposal Date** | August 19, 2018 |
| **Proposer’s Name** | Unurjargal Nyambuu |
| **Course Number** | ECON 2101 |
| **Course Credits, Hours** | 3 |
| **Course Pre / Co-Requisites** | ECON 1101, MAT 2580, MAT 2675 |
| **Catalog Course Description** | This course introduces modern macroeconomic theory at an intermediate-level and studies the entire economy in the short, medium, and long term. The effects of macroeconomic policies at the national level and on a global scale are discussed. Topics include both exogenous and endogenous growth models, the modern Phillips curve, a dynamic model for economic fluctuations, and theories for exchange-rate determination. An in-depth study of equilibrium in the goods and money markets, balance of payments, and aggregate supply and demand. Provides alternative perspectives to theories. |
| **Brief Rationale**  Provide a concise summary of why this course is important to the department, school or college. | This is an intermediate-level course on modern macroeconomic theory; thus, we study the entire US economy as well as its interactions with the global economic system. Students will learn how to analyze the economy in the short, medium, and long run, and evaluate fiscal and monetary policies. Alternative perspectives will be provided. This course builds a theoretical foundation and essential tools required for analyzing macroeconomic data and an explanation of practical problems. It will complement the Data Analytics – Economics program in the Social Science Department and will be required for students in that major. |
| **CUNY – Course Equivalencies**  Provide information about equivalent courses within CUNY, if any. | Similar courses are offered at other CUNY colleges including:  Baruch: ECO 3200 Intermediate Macroeconomics  City: ECO 20350 Intermediate Macroeconomics  Hunter: ECO 30100 Intermediate Macroeconomics  York: ECON 210 Intermediate Macroeconomics |
| **Intent to Submit as Common Core**  If this course is intended to fulfill one of the requirements in the common core, then indicate which area. | No |
| **For Interdisciplinary Courses:**   * Date submitted to ID Committee for review * Date ID recommendation received   - Will all sections be offered as ID? Y/N | N/A |
|  |
|  |
| **Intent to Submit as a Writing Intensive Course** | N/A |

**NEW COURSE PROPOSAL CHECK LIST**

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

|  |  |
| --- | --- |
| **Completed NEW COURSE PROPOSAL FORM** |  |
| * Title, Number, Credits, Hours, Catalog course description | X |
| * Brief Rationale | X |
| * CUNY – Course Equivalencies | X |
| Completed [Library Resources and Information Literacy Form](https://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/curriculum_modification_library_form-rev3F16.doc) | X |
| **Course Outline**  Include within the outline the following. |  |
| Hours and Credits for Lecture and Labs  If hours exceed mandated Carnegie Hours, then rationale for this | X |
| Prerequisites/Co- requisites | X |
| Detailed Course Description | X |
| Course Specific Learning Outcome and Assessment Tables   * Discipline Specific * General Education Specific Learning Outcome and Assessment Tables | X |
| Example Weekly Course outline | X |
| Grade Policy and Procedure | X |
| Recommended Instructional Materials (Textbooks, lab supplies, etc) | X |
| Library resources and bibliography | X |
| **Course Need Assessment.**  Describe the need for this course. Include in your statement the following information. |  |
| Target Students who will take this course. Which programs or departments, and how many anticipated?  Documentation of student views (if applicable, e.g. non-required elective). | X |
| Projected headcounts (fall/spring and day/evening) for each new or modified course. | X |
| If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction. | X |
| Where does this course overlap with other courses, both within and outside of the department? | X |
| Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this? | X |
| If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need. | N/A |
| **Course Design**  Describe how this course is designed. |  |
| Course Context (e.g. required, elective, capstone) | X |
| Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)? | X |
| Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture) | X |
| How does this course support Programmatic Learning Outcomes? | X |
| Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program. | N/A |
| **Additional Forms for Specific Course Categories** |  |
| [Interdisciplinary Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/Application-for-Interdisciplinary-Course-Designation.docx) (if applicable) | N/A |
| Interdisciplinary Committee Recommendation (if applicable and if received)\*  \*Recommendation must be received before consideration by full Curriculum Committee | N/A |
| [Common Core (Liberal Arts) Intent to Submit](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/CommonCoreCourseSubmissionForm_4.2.12.doc) (if applicable) | N/A |
| Writing Intensive Form if course is intended to be a WIC (under development) | N/A |
| If course originated as an experimental course, then results of evaluation plan as developed with director of assessment. | N/A |
| **(Additional materials for [Curricular Experiments](http://www.300jaystreet.com/college-council/curriculum_proposals/curricular-experiments))** |  |
| Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information). |  |
| Established Timeline for Curricular Experiment |  |

**Proposed Course Name: Intermediate Macroeconomics**

**Course Overview & Rationale**

This intermediate-level course provides in-depth theoretical knowledge on modern macroeconomics to students who are familiar with introductory-level theory, concepts, and economic tools introduced in the introductory macroeconomics class. Besides analyzing the economy in the short run, students will focus on medium and long-term analysis and dynamics of an economy. Students will study and evaluate alternative perspectives and contrast different economic growth theories based on both exogenous and endogenous factors. The course studies the determinants of long-term economic growth and possible ways of achieving sustainability; this last issue has become a growing concern in our modern society. At the beginning, the course will cover domestic macroeconomic activities, including the goods and money markets, and the impact of fiscal and monetary policies on the entire economy. The focus of this class will be on the analysis of an open economy that takes into account interactions with external sectors. This is because, countries have become increasingly interdependent due to more frequent and rapid increase in the volume of goods, services, capital and labor moving across borders. With all the changes in economic conditions and the growing importance of international economics and its effects on businesses, governments and even on our daily lives, it has become essential to have a more thorough theoretical knowledge of the field of international macroeconomics. Students will thus acquire a higher level of theoretical knowledge of macroeconomics. By applying economic tools and studying different theoretical approaches, students will be more able to effectively evaluate policies and understand how and why fiscal and monetary policies are structured as they are. The integration of theoretical understanding with practical problem solving is a key element of this course. Thus, this course serves as a theoretical foundation for ECON 3101 (Applied Macroeconomics), a course where the theory will be applied, tested, and estimated and where macroeconomic data will be analyzed. Therefore, students are required to take this course first. Students will use mathematical techniques that they have learned in core courses in mathematics. The course is integral to the proposed Bachelor of Science in Data Analytics – Economics program of the Social Science department.

**Course need**: Students who would take this class: this is a required course for students who intend to major in Data Analytics in Economics.

**Department:** Social Science

**Program**: Bachelor of Science in Data Analytics/Economics

**The number of section (s) anticipated**: one section for the third year

**Projected headcount**: 20 students

**Physical resources required**: Basic smart room set**-**up**:** a screen, and an overhead projector/a TV set that is run by and connected to a computer.

**Course overlap**: None.

**Faculty qualified for teaching this course**: Yes, there are faculty members who are qualified to teach this course.

**Course design**

**Course context**: This course will be required of students in the Data Analytics/Economics major. Students are required to complete homework assignments, take exams, and develop a theoretical research project which will culminate in a final presentation at the end of the semester.

**Course structure**: This course will be offered in a lecture style/format.

**Anticipated pedagogical strategies and instructional design**: This class will be run in a lecture-activity style/format. The lectures will provide the theoretical foundation and the environment to discuss critical issues in macroeconomics. Creative in-class activities and discussions on the subject between the instructor and students will be organized.

**Providing support to programmatic learning outcomes**: This course requires satisfactory completion of homework assignments, two exams, and a final term project/presentation.

NEW YORK CITY COLLEGE OF TECHNOLOGY

The City University of New York

Department of Social Science

ECON 2101 (3 Class Hours, 3 Credits)

Intermediate Macroeconomics

ECON 2101: Intermediate Macroeconomics

PREREQUISITE: ECON 1101, MAT 2580, MAT 2675

**CATALOG DESCRIPTION:**This course introduces modern macroeconomic theory at an intermediate-level and studies the entire economy in the short, medium, and long term. The effects of macroeconomic policies at the national level and on a global scale are discussed. Topics include both exogenous and endogenous growth models, the modern Phillips curve, a dynamic model for economic fluctuations, and theories for exchange-rate determination. An in-depth study of equilibrium in the goods and money markets, balance of payments, and aggregate supply and demand. Provides alternative perspectives to theories.

**COURSE TEXT:**

Gregory N Mankiw. 2016. Macroeconomics, 9th Edition. Macmillan.

Julio Garín, Robert Lester, & Eric Sims, Intermediate Macroeconomics, manuscript (open to public, obtain the latest version from: <https://www3.nd.edu/~esims1/gls_textbook.html>)

Additional reading material in particular research papers and reports will be assigned. The instructor will provide students with lecture notes*.*

**Online data and information resources:**

ScienceDirect <https://www.sciencedirect.com/>

Federal Reserve Economic Data (FRED), <https://fred.stlouisfed.org/>

Federal Reserve Bank, <https://www.federalreserve.gov/>

U.S. Bureau of Economic Analysis (BEA),<https://www.bea.gov/>

U.S. Bureau of Labor Statistics*,* <https://www.bls.gov/>

U.S. Census Bureau,<https://www.census.gov/en.html>

The [National Bureau of Economic Research](http://www.nber.org/data/), <http://www.nber.org/>

World Development Indicators by The World Bank, <https://data.worldbank.org/products/wdi>

International Financial Statistics by IMF, <https://www.imf.org/en/Data>

Data.gov [http://data.gov](http://data.gov/)

**COURSE INTENDED LEARNING OUTCOMES/ASSESSMENT METHODS**

Upon completion of the course, students will be able to address the following key discipline issues:

|  |  |
| --- | --- |
| **Learning Outcomes** | **Assessment Methods** |
| Demonstrate knowledge of modern macroeconomic theory and present alternative perspectives. | Multiple choice, short answer, and numerical questions on exams; short essay writing for homework; classroom discussions; a term project and an oral presentation. |
| Define different factors that contribute to economic growth and sustainability. Understand the difference between exogenous and endogenous models and conduct a critical assessment of these models. | Short answer questions on exams; short essay writing for homework; classroom discussions; a term project and an oral presentation. |
| Derive equilibrium in both the goods and money markets using the IS-LM model and extend it to IS-LM-AD-AS model. | Short answer and numerical questions on exams; short essay writing for homework. |
| Apply analytical tools and economic perspectives, and understand the significance of policy changes; discuss how fiscal and monetary policies are structured to address domestic and international economic conditions. | Short essay writing for homework; classroom discussions; a term project and an oral presentation. |
| Derive an open economy model from a closed economy framework based on balance of payments accounting; assess the impact of macroeconomic policy; and discuss policy options. | Short answer and numerical questions on exams; short essay writing for homework; classroom discussions; a term project and an oral presentation. |
| Integrate theoretical understanding with practical problems. Work with real data, such as inflation, money supply, exchange rates, balance of payments, and apply theories to real-world problems. | A term project and an oral presentation. |

**GENERAL EDUCATION LEARNING OUTCOMES/ASSESSMENT METHODS**

|  |  |
| --- | --- |
| **General Education Outcomes** | **Assessment Methods** |
| **1. KNOWLEDGE:**  Develop knowledge from a range of disciplinary perspectives, and develop the ability to deepen and continue learning. | 1. Multiple choice, short answer, and numerical questions on exams; short essay writing for homework; classroom discussions; a term project and an oral presentation. |
| **2. SKILLS:**  Develop and use the tools needed for communication, inquiry, analysis, and productive work. | 1. Exam short answer and numerical questions; classroom discussions; short essay and problem solving for homework; and a term project and an oral presentation. |
| **3. INTEGRATION:**  Work productively within and across disciplines. | 1. Short answer and numerical questions on exams and homework; and a term project and an oral presentation. |
| **4. VALUES, ETHICS, AND RELATIONSHIPS:**  Understand and apply values, ethics, and diverse perspectives in personal, civic, and cultural/global domains. | 1. Classroom discussions; teamwork, term project and an oral presentation. |

**SCOPE OF ASSIGNMENTS**

There will be three or four homework assignments covering numerical problem-solving as well as short essay questions during the semester; a term project assignment involving some outside research and preparing a paper (5-7 pages) that requires gathering and analyzing of data and related information and an oral presentation; two exams.

**METHOD OF EVALUATION** – elements and weight of factors determining the students’ grade

|  |  |
| --- | --- |
| Homework assignments | 10% |
| Exam 1 | 25% |
| Exam 2 | 25% |
| Term project/presentation | 40% |
| Total | 100% |

**GRADE SCALE:**

|  |  |  |  |
| --- | --- | --- | --- |
| 93 – 100 = A  90 - 92.9 = A- | 87 - 89.9 = B+  83 - 86.9 = B  80 - 82.9 = B- | 77 - 79.9 = C+  70 - 76.9 = C | 60 - 69.9 = D  0 - 59.9 = F |

**COURSE OUTLINE:**

|  |  |  |
| --- | --- | --- |
| **Week** | **Topics** | **Assignment/Reading\*** |
| 1 | **Overview and Introduction; Measurement; Financial Crises**   1. Measuring GDP, Aggregate Expenditure 2. Price Indices, Inflation 3. Savings and Investments 4. Financial Crisis | Gorton (2010);  Mankiw (2016). |
| 2 | **Economic Growth I**   1. Sources of Economic Growth; Income Inequality 2. The Accumulation of Capital 3. Population Growth | Frankel (1997);  Mankiw (2016). |
| 3 | **Economic Growth II**   1. Technological Progress in the Solow Model 2. From Growth Theory to Growth Empirics 3. Policies to Promote Growth 4. Beyond the Solow Model: Endogenous Growth Theory | Solow (1956); Basu et al. (2006); Mankiw (2016). |
| 4 | **Inflation, Unemployment, and the Phillips Curve**   1. Tradeoff between Inflation and Unemployment 2. The History of the Modern Phillips Curve 3. Derivation of Phillips Curve from the AS Curve | Mankiw (2016). |
| 5 | ***Exam\*\* 1*** |  |
| 6 | **Equilibrium in Goods and Money Markets (IS-LM Model)**   1. Goods Market and Derivation of IS Curve 2. Money Market and Derivation of LM Curve 3. Effects of Fiscal and Monetary Policies | Mankiw (2016);  Garín, Lester, & Sims. |
| 7 | **IS-LM-AD-AS Model (Neoclassical vs New Keynesian Approach)3**   1. Derivation of AD and AS curves and their Shifts 2. Effects of shocks in IS-LM-AD-AS Equilibrium 3. Explaining Great Recession using New Keynesian IS-LM-AD-AS model | Garín, Lester, & Sims;  Blanchard & Gali (2007); Mankiw (2016). |
| 8 | **Monetary Policy**   1. A Model of Money Supply 2. Monetary Policy Instruments 3. Macroeconomic Effects of Monetary Policy | Campbell et al. (2012); Mankiw (2016);  Lecture Notes. |
| 9 | **Fiscal Policy**   1. Fiscal Policy Instruments 2. The Effects of Fiscal Policy 3. Government Debt and Budget Deficits | Mankiw (2016);  Lecture Notes. |
| 10 | **Exam\*\* 2** |  |
| 11 | **Theories on Exchange Rate Determination**   1. Determinants of Exchange Rate 2. Trade Flow Model 3. Purchasing Power Parity 4. Covered Interest Parity 5. Uncovered Interest Parity 6. Monetary Approach | Aliber (1973);  Bilson (1978);  Groen (2000);  Bilson & Marston (2007);  Mankiw (2016);  Garín, Lester, & Sims;  Lecture Notes. |
| 12 | **International Flows of Capital and Goods, and Balance of Payments (BOP)**   1. BOP Principle 2. BOP Accounts 3. Current Account Imbalances | IMF Balance of Payments Manual;  Lecture Notes. |
| 13 | **The Mundell-Fleming Model for the Open Economy (IS-LM-BOP Model)**   1. Derivation of the IS-LM-BOP Model 2. Fiscal Policy Effect under Different Capital Mobility and Exchange rate Regime 3. Monetary Policy Effect under Different Capital Mobility and Exchange rate Regime | Fleming (1962);  Mundell (1963);  Garín, Lester, & Sims;  Lane (2001); Mankiw (2016); Lecture Notes. |
| 14 | **A Dynamic Model of Economic Fluctuations**   1. Description of the Model 2. Solving the Model: The Long-Run Equilibrium, The Dynamic AS Curve, The Dynamic AD Curve, The Short-Run Equilibrium 3. Applications: Lessons for Monetary Policy | Mankiw (2016);  Garín, Lester, & Sims. |
| 15 | ***Term Project/Presentation*** |  |

*\* Assignment/reading is subject to change.*

*\*\*Exam dates are subject to change.*

**ACADEMIC INTEGRITY POLICY**

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

**STATEMENT ON STUDENTS WITH DISABILITY:**

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Center for Students Accessibility (CSA). Prior to granting a disability accommodation in this course, the instructor must receive written verification of a student’s eligibility from CSA, which is located in Room L-237 (<http://www.citytech.cuny.edu/accessibility/>). It is the student’s responsibility to initiate contact with the CSA staff and to follow the established procedures for having the accommodation notice sent to the instructor.

**SELECT BIBLIOGRAPHY:**

Aliber, R. Z., 1973. The interest rate parity theorem: a reinterpretation. Journal of Political Economy 81: pp. 1451-9.

Basu, S., J.G. Fernald, Kimball, M.S., 2006. Are Technology Improvements Contractionary? American Economic Review 96 (5):1418-1448.

Bilson, [J.F.O.](http://www.jstor.org.central.ezproxy.cuny.edu:2048/action/doBasicSearch?hp=25&so=rel&wc=off&fc=off&Query=au:%252522John+F.+O.+Bilson%252522&si=1), 1978. The Monetary Approach to the Exchange Rate: Some Empirical Evidence. Staff Papers (International Monetary Fund), Vol. 25, No. 1 (Mar., 1978), pp. 48-75.

Bilson, J.F.O. & Marston, R.C., 2007. Exchange Rate Theory and Practice. Chicago: University of Chicago Press.

Blanchard, O. & Gali, J., 2007. Real Wage Rigidities and the New Keynesian Model. Journal of Money, Credit, and Banking 39(1):35-65.

Campbell, J, Evans, C.L., Fisher, J., Justiniano, A., 2012. Macroeconomic Effects of Federal Reserve Forward Guidance. Brookings Papers on Economic Activity 43 (1):1-80.

Fleming, J.M., 1962. Domestic financial policies under fixed and floating exchange rates. IMF Staff Papers vol. 9, pp. 369-79.

Frankel A.J., 1997. Determinants of Long Term Growth. <https://sites.hks.harvard.edu/fs/jfrankel/Apecgrow.PDF>

Garín, J., Lester, R., & Sims, E., Intermediate Macroeconomics, manuscript (open to public, obtain the latest version from: <https://www3.nd.edu/~esims1/gls_textbook.html>)

Gordon, R.J., 2016. The Rise and Fall of American Growth: The US Standard of Living Since the Civil War. Princeton University Press.

Gorton, G.B., 2010. Questions and Answers about the Financial Crisis. NBER paper 15787. <http://www.nber.org/papers/w15787.pdf>

Groen, J.J.J., 2000. The Monetary Exchange Rate Model as a Long-run Phenomenon. Journal of International Economics 52: 299–319.

IMF. 2009. Balance of payments and international investment position manual (BPM6). Washington, D.C.: International Monetary Fund.

Lane, P.R., 2001. The New Open Economy Macroeconomics: A Survey, Journal of International Economics 54:2, 235-266.

Mankiw, N.G., 2016. Macroeconomics, 9th Edition. Macmillan.

Mundell, R.A., 1963. Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates, Canadian Journal of Economics and Political Science 29: 475-485.

Solow, R.M., 1956. A Contribution to the Theory of Economic Growth. J. of Econ. 70 (1): 65-94.

**LIBRARY RESOURCES & INFORMATION LITERACY: MAJOR CURRICULUM MODIFICATION**

Consult with your library faculty subject specialist (<http://cityte.ch/dir>) **3 weeks before the proposal deadline**.

**Course proposer:** please complete boxes 1-4. **Library faculty subject specialist:** please complete box 5.

|  |  |  |
| --- | --- | --- |
| **1** | **Title of proposal**  ECON 2101 Intermediate Macroeconomics | **Department/Program**  Social Science/Data Analytics-Economics |
|  | **Proposed by** (include email & phone)  Unurjargal Nyambuu [unyambuu@citytech.cuny.edu](mailto:unyambuu@citytech.cuny.edu)  Tel: 718-260-5059 | **Expected date course(s) will be offered**  Spring 2020  **# of students** 20 |

|  |  |
| --- | --- |
| **2** | **The library cannot purchase reserve textbooks for every course at the college, nor copies for all students. Consult our website (<http://cityte.ch/curriculum>) for articles and ebooks for your courses, or our open educational resources (OER) guide (<http://cityte.ch/oer>). Have you considered using a freely-available OER or an open textbook in this course?**  Textbook by Gregory N Mankiw (2016, Macroeconomics, 9th Edition) published by Macmillan is required for the course. Most of the resources/readings for the course are available to students through the library. Older editions of the textbook are acceptable. The required readings can be accessed through the library website. The other resources, including the required manuscript by Julio Garín, Robert Lester, & Eric Sims, Intermediate Macroeconomics is open to public and can be obtained from: <https://www3.nd.edu/~esims1/gls_textbook.html>) |

|  |  |
| --- | --- |
| **3** | **Beyond the required course materials, are City Tech library resources sufficient for course assignments? If additional resources are needed, please provide format details (e.g. ebook, journal, DVD, etc.), full citation (author, title, publisher, edition, date), price, and product link.**  Yes. Research papers and electronic books are available through the library. This include: Bilson, J.F.O. & Marston, R.C. 2007. Exchange Rate Theory and Practice. Chicago: University of Chicago Press. |

|  |  |
| --- | --- |
| **4** | **Library faculty focus on strengthening students' information literacy skills in finding, critically evaluating, and ethically using information. We collaborate on developing assignments and customized instruction and research guides. When this course is offered, how do you plan to consult with the library faculty subject specialist for your area? Please elaborate.**  This course requires students to read and cite research articles and other related material in their homework assignment and a final project. A workshop on how to search for different resources and how to properly cite the resources would be very helpful. |

|  |  |
| --- | --- |
| **5** | **Library Faculty Subject Specialist \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Comments and Recommendations**  **Date** |

**Chancellor’s Report Form**

|  |  |
| --- | --- |
| **Department(s)** | Social Science |
| **Academic Level** | **[ X ] Regular  [   ] Compensatory  [   ] Developmental  [   ] Remedial** |
| **Subject Area** | Data Analytics/Economics |
| **Course Prefix** | ECON |
| **Course Number** | ECON 2101 |
| **Course Title** | Intermediate Macroeconomics |
| **Catalog Description** | This course introduces modern macroeconomic theory at an intermediate-level and studies the entire economy in the short, medium, and long term. The effects of macroeconomic policies at the national level and on a global scale are discussed. Topics include both exogenous and endogenous growth models, the modern Phillips curve, a dynamic model for economic fluctuations, and theories for exchange-rate determination. An in-depth study of equilibrium in the goods and money markets, balance of payments, and aggregate supply and demand. Provides alternative perspectives to theories. |
| **Prerequisite** | ECON 1101, MAT 2580, MAT 2675 |
| **Corequisite** | None |
| **Pre- or corequisite** |  |
| **Credits** | 3 |
| **Contact Hours** | 3 class hours |
| **Liberal Arts** | **[ X ] Yes  [   ] No** |
| **Course Attribute (e.g. Writing Intensive, etc)** |  |
| **Course Applicability** | **[ X ] Major**  **[ ] Gen Ed Required [ ] Gen Ed - Flexible [ ] Gen Ed - College Option**  **[ ] English Composition [ ] World Cultures [ ] Speech**  **[ ] Mathematics [ ] US Experience in its Diversity [ ] Interdisciplinary**  **[ ] Science [ ] Creative Expression [ ] Advanced Liberal Arts**  **[ ] Individual and Society**  **[ ] Scientific World** |
| **Effective Term** | Spring 2020 |

**Rationale:** This is an intermediate-level course on modern macroeconomic theory; thus, we study the entire US economy as well as its interactions with the global economic system. Students will learn how to analyze the economy in the short, medium, and long run, and evaluate fiscal and monetary policies. Alternative perspectives will be provided. This course builds a theoretical foundation and essential tools required for analyzing macroeconomic data and an explanation of practical problems. It will complement the Data Analytics – Economics program in the Social Science Department and will be required for students in that major.

## D.6 ECON 3401 Applied Microeconomics

**New York City College of Technology, CUNY**

**CURRICULUM MODIFICATION PROPOSAL FORM**

This form is used for all curriculum modification proposals. See the [Proposal Classification Chart](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Proposal_Classification_Chart.pdf) for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.

|  |  |
| --- | --- |
| **Title of Proposal** | Applied Microeconomics |
| **Date** | August 27, 2018 |
| **Major or Minor** | Major |
| **Proposer’s Name** | Gulgun Bayaz Ozturk |
| **Department** | Social Science |
| **Date of Departmental Meeting in which proposal was approved** | November 1, 2018 |
| **Department Chair Name** | Peter Parides |
| **Department Chair Signature and Date** | Chair approved this as part of overall proposal. |
| **Academic Dean Name** | Justin Vazquez-Poritz |
| **Academic Dean Signature and Date** | Picture 19 1/27/19 |
| **Brief Description of Proposal**  (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body. | This proposal provides the justification for developing ECON 3401 as a required course in the Data Analytics/Economics program in the Department of Social Science. |
| **Brief Rationale for Proposal**  (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body). | This course will give students the opportunity to study how state of the art techniques learned in statistics, econometrics and machine learning courses can be applied to a variety of microeconomics topics. They will have the chance to utilize their big data skills to understand and analyze the economic and social challenges that the U.S. is facing. This applied course in microeconomics is going to be one of the important building blocks of the Data Analytics/Economics program at the Social Science department by equipping students with the right set of skills that are highly desirable in the labor market. |
| **Proposal History**  (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list). | This is a first submission. |

**ALL PROPOSAL CHECK LIST**

|  |  |
| --- | --- |
| Completed CURRICULUM MODIFICATION FORM including: |  |
| * Brief description of proposal | X |
| * Rationale for proposal | X |
| * Date of department meeting approving the modification | X |
| * Chair’s Signature | X |
| * Dean’s Signature | X |
| Evidence of consultation with affected departments  List of the programs that use this course as required or elective, and courses that use this as a prerequisite. | X |
| Documentation of Advisory Commission views (if applicable). | N/A |
| Completed [Chancellor’s Report Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Chancellor_Report_Quick_Reference_Guide1.doc). | X |

**EXISTING PROGRAM MODIFICATION PROPOSALS**

|  |  |
| --- | --- |
| Documentation indicating core curriculum requirements have been met for new programs/options or program changes. | N/A |
| Detailed rationale for each modification (this includes minor modifications) | N/A |

**New York City College of Technology, CUNY**

**NEW COURSE PROPOSAL FORM**

This form is used for all new course proposals. Attach this to the [Curriculum Modification Proposal Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-10-Curriculum_Modification_Proposal_Form.docx) and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

|  |  |
| --- | --- |
| **Course Title** | Applied Microeconomics |
| **Proposal Date** | August 27, 2018 |
| **Proposer’s Name** | Gulgun Bayaz Ozturk |
| **Course Number** | ECON 3401 |
| **Course Credits, Hours** | 3 |
| **Course Pre / Co-Requisites** | ECON 2401, ECON 3201 |
| **Catalog Course Description** | This course introduces students to important social and economic problems in the United States and provides real-world applications of data science. Through leading research in the field of applied microeconomics, students will study how researchers use big data to understand and tackle problems that we currently face in areas such as education, health, environment and justice with a microeconomic perspective. Students will have the opportunity to utilize their knowledge and skills that were obtained previously in courses like statistics, econometrics and machine learning to understand and analyze important social and economic problems of our time. |
| **Brief Rationale**  Provide a concise summary of why this course is important to the department, school or college. | This course will be one of the applied courses offered by Data Analytics/Economics program at the Social Science department, and it will provide the opportunity to study economic and social applications of large-data statistical models and traditional econometric techniques through frontier research in applied microeconomics. Students will have the chance to utilize their big data skills to understand and analyze the economic and social challenges that the U.S. is facing. |
| **CUNY – Course Equivalencies**  Provide information about equivalent courses within CUNY, if any. | ECON 82300: Applied Microeconometrics offered at CUNY Graduate Center. This course covers traditional econometric techniques used in applied areas of microeconomics such as labor, health and public policy. |
| **Intent to Submit as Common Core**  If this course is intended to fulfill one of the requirements in the common core, then indicate which area. | No |
| **For Interdisciplinary Courses:**   * Date submitted to ID Committee for review * Date ID recommendation received   - Will all sections be offered as ID? Y/N | N/A |
|  |
|  |
| **Intent to Submit as a Writing Intensive Course** | N/A |

**NEW COURSE PROPOSAL CHECK LIST**

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

|  |  |
| --- | --- |
| **Completed NEW COURSE PROPOSAL FORM** |  |
| * Title, Number, Credits, Hours, Catalog course description | x |
| * Brief Rationale | x |
| * CUNY – Course Equivalencies | x |
| Completed [Library Resources and Information Literacy Form](https://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/curriculum_modification_library_form-rev3F16.doc) |  |
| **Course Outline**  Include within the outline the following. |  |
| Hours and Credits for Lecture and Labs  If hours exceed mandated Carnegie Hours, then rationale for this | x |
| Prerequisites/Co- requisites | x |
| Detailed Course Description | x |
| Course Specific Learning Outcome and Assessment Tables   * Discipline Specific * General Education Specific Learning Outcome and Assessment Tables | x |
| Example Weekly Course outline | x |
| Grade Policy and Procedure |  |
| Recommended Instructional Materials (Textbooks, lab supplies, etc) | x |
| Library resources and bibliography | x |
| **Course Need Assessment.**  Describe the need for this course. Include in your statement the following information. |  |
| Target Students who will take this course. Which programs or departments, and how many anticipated?  Documentation of student views (if applicable, e.g. non-required elective). | x |
| Projected headcounts (fall/spring and day/evening) for each new or modified course. | x |
| If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction. | x |
| Where does this course overlap with other courses, both within and outside of the department? | x |
| Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this? | x |
| If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need. | x |
| **Course Design**  Describe how this course is designed. |  |
| Course Context (e.g. required, elective, capstone) | x |
| Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)? | x |
| Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture) | x |
| How does this course support Programmatic Learning Outcomes? | x |
| Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program. | N/A |
| **Additional Forms for Specific Course Categories** |  |
| [Interdisciplinary Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/Application-for-Interdisciplinary-Course-Designation.docx) (if applicable) | N/A |
| Interdisciplinary Committee Recommendation (if applicable and if received)\*  \*Recommendation must be received before consideration by full Curriculum Committee |  |
| [Common Core (Liberal Arts) Intent to Submit](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/CommonCoreCourseSubmissionForm_4.2.12.doc) (if applicable) | N/A |
| Writing Intensive Form if course is intended to be a WIC (under development) | N/A |
| If course originated as an experimental course, then results of evaluation plan as developed with director of assessment. | N/A |
| **(Additional materials for [Curricular Experiments](http://www.300jaystreet.com/college-council/curriculum_proposals/curricular-experiments))** |  |
| Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information). | N/A |
| Established Timeline for Curricular Experiment | N/A |

**Proposed Course Name: Applied Microeconomics**

**Course Overview and Rationale**

Availability of large data sets are starting to transform social sciences. This transformation manifests itself in the field of economics by the rise of empirical economics. Dan Hamermesh, a renowned economist, stated that the percentage of data-based articles in top economics journals increased from 38.4 percent in 1983 to 72.1 percent in 2011. Economists started to take advantage of enormous opportunities offered by better data such as real-time data, data on previously unmeasured activities, large-scale administrative records, and private sector data. In addition to traditional econometric techniques, economists started to utilize large-data statistical models borrowed from fields like computer science to deal with massive volumes of unstructured data. There has been significant progress to develop novel approaches to measure various social and economic activities more effectively using big data. It is expected that the changes in the field of economics will only accelerate with better access to big data. Therefore, it is imperative to have a course with an applied focus to better understand the pressing challenges of our time such as rising inequality and health care costs, low economic mobility, environmental problems among others. By focusing on a broad range of topics with a microeconomic perspective, this course aims to equip our students with the knowledge and skills set required to address challenges we face today.

**Course Need:** Students who intend to major in Data Analytics/Economics degree program would take this class.

**Department**: Social Science Department

**Program**: Bachelor of Science in Data Analytics/Economics

**Number of section(s) anticipated**: One section for the third/fourth year.

**Projected headcount**: 20 students.

**Physical resources required:** The classroom for the lectures would need basic equipment such as a screen and a computer with statistical packages such as R, Python, Matlab and Stata. The classroom for the lab meetings would need a computer with statistical software packages mentioned above for each student in class.

**Course overlap**: None

**Faculty qualified to teach this course**: There are full and part-time faculty members with doctoral degrees who could teach this course.

**Course Design**

**Course context**: The proposed course will be a required course for students majoring in Data Analytics/Economics degree program.

**Course structure**: The proposed course is going to be composed of lectures and lab meetings.

**Anticipated Pedagogical Strategies and Instructional Design:** Various types of assessments methods will be designed to develop an understanding of the big data skills and how they can be used to solve social and economic problems we face today using a microeconomic perspective. In particular, in addition to in-class discussions, homework assignments, and an exam, there will be a term paper where students will have the opportunity to practice their skills to further develop their problem-solving, critical thinking and presentation skills.

**Providing Support to Programmatic Learning Outcomes:** Students must perform satisfactorily on individual assignments, an exam, a term paper and a presentation.

NEW YORK CITY COLLEGE OF TECHNOLOGY

The City University of New York

Department of Social Science

ECON 3401 (3 Class Hours, 3 Credits)

Applied Microeconomics

Pre-requisite: ECON 2401, ECON 3201

**COURSE DESCRIPTION:**

This course introduces students to important social and economic problems in the United States and provides real-world applications of data science. Through leading research in the field of applied microeconomics, students will study how researchers use big data to understand and tackle problems that we currently face in fields such as education, health, environment, and justice. Students will have the opportunity to utilize their knowledge and skills that were obtained previously in courses like statistics, econometrics and machine learning to understand and analyze important social and economic problems of our time.

**TEXTBOOK and COURSE MATERIALS**

This course will use the course materials compiled by Prof. Raj Chetty for his Big Data Course at Stanford University. Course materials will primarily be based on non-technical and technical research papers, working papers, and articles from *The New York Times* and *The Washington Post*.

Below is the link to the course website:

<http://www.equality-of-opportunity.org/bigdatacourse/>

This course will have two lab meetings so that the students can practice their technical skills to analyze a topic of their choice for their term paper. The lab meetings will take place at a computer lab.

Data sources:

Bureau of Economic Analysis: <http://www.bea.gov/>

Centers for Disease Control and Prevention: <https://www.cdc.gov/>

The Equality of Opportunity Project: <http://www.equality-of-opportunity.org/data/>

*The* [National Bureau of Economic Research](http://www.nber.org/data/): <http://www.nber.org/>

*U.S. Bureau of Labor Statistics:* <https://www.bls.gov/>

U.S. Census Bureau:<https://www.census.gov/en.html>

U.S. Social Security Administration: <https://www.ssa.gov/>

**COURSE INTENDED LEARNING OUTCOMES/ASSESSMENT METHODS**

|  |  |
| --- | --- |
| Learning Outcomes | Assessment Methods |
| 1. Study important social and economic problems that the U.S. is currently facing, and the tools used by microeconomists to deal with those problems. | Class discussions and short answer questions on graded exams. |
| 1. Learn different sources of data to conduct microeconomic research. | Class discussions and individual assignments. |
| 1. Learn how big data can be used to understand and solve various social and economic problems of our time with a microeconomic focus. | Class discussions on assigned research papers; and/or short-answer questions on graded exam. |
| 1. Develop the skills needed to conduct research using state of the art techniques in statistics, econometrics and machine learning to analyze economic data. | Class discussions, individual assignments and/or group project. |

**GENERAL EDUCATION LEARNING OUTCOMES/ASSESSMENT METHODS**

|  |  |
| --- | --- |
| Learning Outcomes | Assessment methods |
| Knowledge: To develop a good understanding of the social and economic problems that the U.S. is currently facing. | Review of material in short exercises; short answer question on graded exams and assignments. |
| Skills: Develop the ability to analyze quantitative data. | Class discussions, homework assignments, term paper and exams where students apply the tools they have learned. |
| Integration: Use statistical and machine learning methods that complement traditional econometric techniques to analyze various economic and social problems. | Homework assignments, term paper and exams. |
| Values, Ethics and Relationships: Develop an ability to apply diverse perspectives to the understanding of social and economic issues. | Class discussions and short answer questions on graded exams. |

**SCOPE OF ASSIGNMENTS**

Students will complete a midterm exam, class assignments, readings, and prepare a term paper which they will get to present in class at the end of the semester. In the midterm exam and the assignments, students will be required to demonstrate a clear understanding of key concepts covered in the course and the readings. For their term paper, students will choose a topic of interest and utilize their big data skills to conduct a microeconomic analysis. They will present their research at the end of the semester.

**GRADE POLICY AND PROCEDURE METHOD OF GRADING**:

Elements and weight of factors determining course grade

|  |  |
| --- | --- |
| 1. Participation | 20% |
| 2. Homework | 20% |
| 3. Midterm Exam | 20% |
| 4.Term paper | 20% |
| 5. Presentation | 20% |

**GRADING POLICY**

All grades will be calculated according to the college grade scale:

Letter Grade Meaning of Letter Grade Number Grade

A Exceptional 100-93

A- Superior 92.9-90

B+ Very good 89.9-87

B Good 86.9-83

B- Above Average 82.9-80

C+ Slightly Above Average 79.9-77

C Average 76.9-70

D Poor 69.9-60

F Failure 59.9-0

**ACADEMIC INTEGRITY POLICY**

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

**STATEMENT ON STUDENTS WITH DISABILITY:**

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Center for Students Accessibility (CSA). Prior to granting a disability accommodation in this course, the instructor must receive written verification of a student’s eligibility from CSA, which is located in Room L-237 (<http://www.citytech.cuny.edu/accessibility/>). It is the student’s responsibility to initiate contact with the CSA staff and to follow the established procedures for having the accommodation notice sent to the instructor.

**WEEKLY COURSE OUTLINE**

**Part I: Equality of Opportunity**

Week 1

Geography of Economic Mobility in the U.S.

Income Inequality and Mobility

Upward Mobility within America

Geographical variation in upward mobility

Characteristics of low and high mobility areas

Method: Quasi-experimental design

Required Reading:

* Chetty, Raj, Nathaniel Hendren, Patrick Kline, and Emmanuel Saez. 2014. “Where Is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States.” *Quarterly Journal of Economics* 29 (4): 1553–1623.
* Chetty, Raj, Nathaniel Hendren, Frina Lin, Jeremy Majerovitz, and Benjamin Scuderi. 2016. “Childhood Environment and Gender Gaps in Adulthood.” *American Economic Review Papers and Proceedings* 106 (5): 282–88.

Optional Reading:

* Chetty, Raj, and Nathaniel Hendren. 2016. “The Impacts of Neighborhoods on Intergenerational Mobility I: Childhood Exposure Effects.” NBER Working Paper No. 23001.
* Chetty, Raj, and Nathaniel Hendren. 2016. “The Impacts of Neighborhoods on Intergenerational Mobility II: County-Level Estimates.” NBER Working Paper No. 23002.

Week 2

Policies to Improve Economic Mobility

Affordable housing policies

Housing vouchers

Education (will be discussed in Part II)

Method: Randomized Experiments; Quasi Experimental Methods

Required Reading:

* Chetty, Raj, Nathaniel Hendren, and Lawrence F Katz. 2016. “The Effects of Exposure to Better Neighborhoods on Children: New Evidence from the Moving to Opportunity Experiment.” *American Economic Review* 106 (4): 855–902.
* Chetty, Raj, David Grusky, Maximilian Hell, Nathaniel Hendren, Robert Manduca, and Jimmy Narang. 2016. “The Fading American Dream: Trends in Absolute Income Mobility Since 1940.” NBER Working Paper No. 22910.

Week 3:

Opportunity, Innovation and Economic Growth

Required Reading:

* Cimpian, Andrei and Sarah-Jane Leslie. 2017. “[Why Young Girls Don’t Think They Are Smart](https://www.nytimes.com/2017/01/26/well/family/why-young-girls-dont-think-they-are-smart-enough.html) [Enough](https://www.nytimes.com/2017/01/26/well/family/why-young-girls-dont-think-they-are-smart-enough.html).” *The New York Times*.
* Bian, Lin, Sarah-Jane Leslie, and Andrei Cimpian. 2017. “Gender Stereotypes about Intellectual Ability Emerge Early and Influence Children’s Interests.” *Science* 391 (6323): 389–91.
* Alex Bell, Raj Chetty, Xavier Jaravel, Neviana Petkova, John Van Reenen. 2016. “The Lifecycle of Inventors.” Working Paper.

**Part II: Education**

This section will discuss the policies needed to improve primary education, to achieve more effective higher education, and to make top-colleges more accessible to low-income students.

Week 4

Higher Education

Education and Upward Mobility

Differences in Mobility Rates Across Colleges

College Characteristics with High Mobility rates

Method: Quasi-Experimental Methods: Regression discontinuity

Required reading:

* Aisch, Gregor, Larry Buchanan, Amanda Cox, and Kevin Quealy. 2017. “[Some Colleges Have](https://www.nytimes.com/interactive/2017/01/18/upshot/some-colleges-have-more-students-from-the-top-1-percent-than-the-bottom-60.html) [More Students From the Top 1 Percent Than the Bottom 60. Find Yours](https://www.nytimes.com/interactive/2017/01/18/upshot/some-colleges-have-more-students-from-the-top-1-percent-than-the-bottom-60.html).” *The New York Times*.
* Leonhardt, David. 2017. “[America’s Great Working Class Colleges](https://www.nytimes.com/2017/01/18/opinion/sunday/americas-great-working-class-colleges.html).” *The New York Times*.
* Chetty, Raj, John N Friedman, Emmanuel Saez, Nicholas Turner, and Danny Yagan. 2017. “Mobility Report Cards: The Role of Colleges in Intergenerational Mobility.” Working Paper.
* Hoxby, Caroline Minter, and Christopher Avery. 2013. “The Missing ‘One-Offs’: The Hidden Supply of High-Achieving, Low Income Students.” *Brookings Papers on Economic Activity*, 1–66.

Optional Reading:

* Hoxby, Caroline Minter, and Sarah E. Turner. 2015. “What High-Achieving Low-Income Students Know About College.” *American Economic Review: Papers & Proceedings* 105 (5): 514–17.
* Hoxby, Caroline, and Sarah Turner. 2013. “Expanding College Opportunities for High-Achieving, Low Income Students.” *Stanford Institute for Economic Policy Research Discussion Paper*, no. 12-014: 1–57.

Week 5

Primary Education

* Porter, Eduardo. 2015. “[Education Gap Between Rich and Poor is Growing Wider](https://www.nytimes.com/2015/09/23/business/economy/education-gap-between-rich-and-poor-is-growing-wider.html?_r=0).” *The New York Times.*
* Leonhardt, David. 2010. “[The Case for $320,000 Kindergarten Teachers](http://www.nytimes.com/2010/07/28/business/economy/28leonhardt.html).” *The New York Times.*
* Chetty, Raj, John N. Friedman, Nathaniel Hilger, Emmanuel Saez, Diane Whitmore Schanzenbach, and Danny Yagan. 2011. “How Does Your Kindergarten Classroom Affect Your Earnings? Evidence from Project STAR.” *Quarterly Journal of Economics* 126 (4): 1593–1660.
* Reardon, Sean. 2016. “School Segregation and Racial Academic Achievement Gaps.” *Russell Sage Foundation Journal of the Social Sciences* 2 (5): 34–57.

Optional Reading

* Lowrey, Annie. 2012. “[Big Study Links Good Teachers to Lasting Gain](http://www.nytimes.com/2012/01/06/education/big-study-links-good-teachers-to-lasting-gain.html).” *The New York Times.*
* Chetty, Raj, John N Friedman, and Jonah E Rockoff. 2014. “Measuring the Impacts of Teachers I: Evaluating Bias in Teacher Value-Added Estimates.” *American Economic Review* 104 (9): 2593–2632.
* Chetty, Raj, John N Friedman, and Jonah E Rockoff. 2011. “Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood.” *American Economic Review* 104 (9): 2633–79.
* Fredriksson, Peter, Björn Öckert, and Hessel Oosterbeek. 2013. “Long-Term Effects of Class Size.” *The Quarterly Journal of Economics* 128 (1): 249–85.
* Reardon, Sean, Demetra Kalagrides, and Kenneth Shores. 2016. “The Geography of Racial/ Ethnic Test Score Gaps.” *CEPA Working Paper*, no. 16.

Week 6

Do Charter Schools Work?

Discussion on government and market-based solutions to improving education

Market competition and Charter Schools

Method: Quasi-Experimental method: Regression discontinuity

Required reading:

* Leonhardt, David. 2016. “[Schools That Work](https://www.nytimes.com/2016/11/06/opinion/sunday/schools-that-work.html).” *The New York Times*.
* Chabrier, Julia, Sarah Cohodes, and Philip Oreopoulous. 2016. “What Can We Learn From Charter School Lotteries?” *Journal of Economic Perspectives* 30 (3): 57–84.
* Abdulkadiroǧlu, Atila, Joshua D. Angrist, Susan M. Dynarski, Thomas J. Kane, and Parag A. Pathak. 2011. “Accountability and Flexibility in Public Schools: Evidence from Boston’s Charters and Pilots.” *Quarterly Journal of Economics* 126 (2): 699–748.
* Dobbie, Will, and Roland G. Fryer. 2011. “Are High-Quality Schools Enough to Increase Achievement among the Poor? Evidence from the Harlem Children’s Zone.” *American Economic Journal: Applied Economics* 3 (3): 158–87.
* Baude, Patrick, Marcus Casey, Eric A Hanushek, and Steven G Rivkin. 2014. “The Evolution of Charter School Quality.” NBER Working Paper 20645.

Week 7

Review and the **Exam**

**Part III: Health**

This section will talk about differences in health outcomes across different subgroups of the population, and the improvements needed for better functioning of health insurance system and health care provision in the U.S. It illustrates how big data is helping us learn how to improve health.

Week 8

Improving Health Outcomes

Descriptive analysis of health outcomes in U.S. population   
Method: Survival analysis

Epidemiology application: Using big data to forecast pandemics   
Method: Predictive modeling; Overfitting problem; Out-of-Sample Validation

Required reading:

* Irwin, Neil and Quoctrung Bui. 2016. “[The Rich Live Longer Everywhere. For the Poor,](https://www.nytimes.com/interactive/2016/04/11/upshot/for-the-poor-geography-is-life-and-death.html) [Geography Matters](https://www.nytimes.com/interactive/2016/04/11/upshot/for-the-poor-geography-is-life-and-death.html).” *The New York Times*.
* Chetty, Raj, Michael Stepner, Sarah Abraham, Shelby Lin, Benjamin Scuderi, Nicholas Turner, Augustin Bergeron, and David Cutler. 2016. “The Association Between Income and Life Expectancy in the United States, 2001-2014.” *Journal of the American Medical Association* 315 (16): 1750–66. [Non-technical summary.](https://healthinequality.org/documents/paper/healthineq_summary.pdf)
* Ginsberg, Jeremy, Matthew H Mohebbi, Rajan S Patel, Lynnette Brammer, Mark S Smolinski, and Larry Brilliant. 2009. “Detecting Influenza Epidemics Using Search Engine Query Data.” *Nature* 457:1012-4
* Lazer, David, Ryan Kennedy, Gary King, and Alessandro Vespignani. 2014. “The Parable of Google Flu: Traps in Big Data Analysis.” *Science* 343 (6167): 1203–5.

Week 9

The Economics of Health Care and Insurance

Oregon Health Insurance Experiment

Estimating Demand Curve for Health Insurance

Economics applications: Impacts of health insurance coverage  
Method: Regression discontinuities

Epidemiology and Public Health: randomized trials

Required reading:

* Leonhardt, David. 2017. “[The New Study that Shows Trumpcare’s Damage](https://www.nytimes.com/2017/05/03/opinion/trump-health-care.html?_r=0)” *The New York Times*.
* Quealy, Kevin and Margot Sanger-Katz. 2015. “[The Experts Were Wrong About the Best](https://www.nytimes.com/interactive/2015/12/15/upshot/the-best-places-for-better-cheaper-health-care-arent-what-experts-thought.html) [Places for Better and Cheaper Health Care](https://www.nytimes.com/interactive/2015/12/15/upshot/the-best-places-for-better-cheaper-health-care-arent-what-experts-thought.html).” *The New York Times*.
* [Non-technical summary](https://scholar.harvard.edu/files/hendren/files/executive_summary.pdf) “Subsidizing Health Insurance for Low-Income Adults:

Evidence from Massachusetts and Implications for Future Health Reforms”

* [Non-technical summary](https://www.povertyactionlab.org/sites/default/files/publications/Insuring_the_Uninsured.pdf) of research on the Oregon Health Insurance Experiment.
* Cooper, Zack, Stuart Craig, Martin Gaynor, and John Van Reenen. 2015. “The Price Ain’t Right? Hospital Prices and Health Spending on the Privately Insured.” *NBER Working Paper*. NBER Working Paper No. 21815.
* Baicker, Katherine, Sarah L. Taubman, Heidi L. Allen, Mira Bernstein, Jonathan H. Gruber, Joseph P. Newhouse, Eric C. Schneider, Bill J. Wright, Alan M. Zaslavsky, and Amy N. Finkelstein. 2013. “The Oregon Experiment — Effects of Medicaid on Clinical Outcomes.” *New England Journal of Medicine* 368: 1713–22.
* Wherry, Miller, Kaestner, Meyer. “Childhood Medicaid Coverage and Later Life Health Care Utilization” *REStat* 2017.

Week 10

Lab meeting # 1

This is the first of two lab meetings we will have in this class. The goal of the lab meetings is to ensure that students have a hands-on experience to practice big data skills to solve social and economic problems learned throughout the class. In these meetings, students are required to choose a topic of interest and either replicate someone else’s work or write a code using a programming language to tackle a problem of interest. They will then write a **term paper** which will be submitted at the end of the semester. Detailed instructions for the term paper will be provided at the beginning of the semester.

**Part IV: Environment**

This section will talk about how the climate is changing and the economic policies needed to improve environmental outcomes to affect the rate of climate change.

We will study how Big Data are used to understand the effects of pollution on long-term economic outcomes such as employment and earnings, and the policies that can be implemented to preserve the environment.

Week 11

Social Costs of Climate Change and Pollution

Economics of Externalities

Estimating the Impact of Climate Change

Estimating the Impact of Air Pollution on employment and earnings

Method: Quasi-Experimental Research Design: Difference-in-Differences

Required Reading:

* National Climate Assessment. <http://nca2014.globalchange.gov/>
* Crleton, T. A., and S. M. Hsiang. 2016. “Social and Economic Impacts of Climate.” *Science* 353 (6304): 1112.
* Isen, Adam, Maya Rossin-Slater, and W Reed Walker. 2014. “Every Breath You Take - Every Dollar You’ll Make: The Long-Term Consequences of the Clean Air Act of 1970.” Forthcoming in the *Journal of Political Economy*. [Non-technical summary](http://voxeu.org/article/long-term-consequences-1970-clean-air-act).

Optional Reading:

* Greenstone, Michael. 2017. “[What Financial Markets Can Teach Us About Managing Climate Risks](https://www.nytimes.com/2017/04/04/upshot/what-financial-markets-can-teach-us-about-managing-climate-risks.html?_r=2).” *The New York Times*.
* Currie, Janet, Lucas Davis, Michael Greenstone, and Walker Reed. 2015. “Environmental Health Risks and Housing Values: Evidence from 1,600 Toxic Plant Openings and Closings.” *American Economic Review* 105 (2): 678–709.
* Giglio, Stefano, Matteo Maggiori, and Johannes Stroebel. 2015. “Very Long-Run Discount Rates.” *Quarterly Journal of Economics* 130 (1): 1–53.
* Keiser, David A and Joseph S Shapiro. 2017. “Consequences of the Clean Water Act and the Demand for Water Quality.” NBER Working Paper 23070.

Week 12

Policies to Mitigate Climate Change

Pigouvian taxes, and its effects on gas prices and gas demand

Demand for Hybrid Cars, Electricity Prices and Electricity consumption

Tiered Price Schedules

Effective comparison of alternative policies using Big Data

Method: Regression Discontinuity

Required Reading:

* Gardiner, B. 2014. “[Energy Efficiency May Be the Key to Saving Trillions](https://www.nytimes.com/2014/12/01/business/energy-environment/energy-efficiency-may-be-the-key-to-saving-trillions.html).” *The New York Times*.
* Schultz, P. Wesley, Jessica M. Nolan, Robert B. Cialdini, Noah J. Goldstein, and Vladas Griskevicius. 2007. “The Constructive, Destructive, and Reconstructive Power of Social Norms.” *Psychological Science* 18 (5): 429–34.
* Allcott, Hunt, and Todd Rogers. 2014. “The Short-Run and Long-Run Effects of Behavioral Interventions: Experimental Evidence from Energy Conservation.” *American Economic Review* 104 (10): 3003–37.
* Doyle, Joseph J., and Krislert Samphantharak. 2008. “$2.00 Gas! Studying the Effects of a Gas Tax Moratorium.” *Journal of Public Economics* 92 (3-4): 869–84.
* Ito, Koichiro. 2014. “Do Consumers Respond to Marginal or Average Price? Evidence from Nonlinear Electricity Pricing.” *American Economic Review* 104 (2): 537–63.

Week 13

Lab meeting #2

Students will continue working on their **term paper** during and outside class to finalize their term paper which will be due at the end of the semester.

**Part IV: Justice**

This section will talk about how big data can be used to make criminal justice fair by eliminating biases that adversely affect minorities in the criminal justice system.

Week 14

Required Reading:

Criminal Justice and Discrimination

Racial Discrimination in Hiring, and Among Airbnb Hosts

Sex-based Discrimination in Orchestra Auditions

Comparing the Accuracy of Human Decisions and Machine Predictions in the Criminal Justice System

Method: Experimental and Quasi-Experimental Methods to test for Discrimination; Machine Learning Using Decision Trees

Required Reading:

* Hvistendahl, Mara. 2016. [Can ‘Predictive Policing’ Prevent Crime Before It Happens](http://www.sciencemag.org/news/2016/09/can-predictive-policing-prevent-crime-it-happens)? *Science News*.
* Bertrand, Marianne, and Sendhil Mullainathan. 2004. “Are Emily and Greg More Employable Than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination.” *American Economic Review* 94 (4): 991–1013.
* Abrams, David S, Marianne Bertrand and Sendhil Mullainathan. 2012. “Do Judges Vary in Their Treatment of Race?” *Journal of Legal Studies* 41 (2): 347–83.
* Danziger, S., J. Levav, and L. Avnaim-Pesso. 2011. “Reply to Weinshall-Margel and Shapard: Extraneous Factors in Judicial Decisions Persist.” *Proceedings of the National Academy of Sciences* 108 (42): E834–E834.
* Goldin, Claudia, and Cecilia Rouse. 2000. “Orchestrating Impartiality: The Impact of ‘Blind’ Auditions on Female Musicians.” *American Economic Review* 90 (4): 715–41.
* Kleinberg, Jon, Himabindu Lakkaraju, Jure Leskovec, Jens Ludwig, and Sendhil Mullainathan. 2017. “Human Decisions and Machine Predictions.” NBER Working Paper 23180.
* Mohler, George, Martin Short, P. Jeffrey Brantingham, Frederick Schoenberg, and George Tita. 2011. “Self-Exciting Point Process Modeling of Crime.” *Journal of the American Statistical Association* 106 (493): 100–108.

Week 15

Review and **Final Exam**

**SELECT BIBLIOGRAPHY**

Angrist, J. D., & Pischke, J. (2009). Mostly harmless econometrics: An empiricist's companion. Princeton: Princeton University Press.

Browning, E. K., Zupan, M. A., & Lunn, J. (2004). Microeconomics: Theory and applications (8th ed.). Hoboken, NJ: Wiley.

CORE Team (2017). The Economy, Economics for a Changing World. Oxford: Oxford University Press.

Ehrenberg, R. G., & Smith, R. S. (1994). *Modern labor economics: Theory and public policy*. New York: HarperCollins College Publishers.

Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. (2013). An introduction to statistical learning: with applications in R. New York :Springer.

Piketty, T., & Goldhammer, A. (2014). *Capital in the twenty-first century*. Cambridge Massachusetts: The Belknap Press of Harvard University Press.

Santerre, R. E., & Neun, S. P. (2013). *Health economics: Theory, insights, and industry studies* (6th ed.). Mason, Ohio : Andover: South-Western.

Wooldridge, Jeffrey M., 1960-. (2012). Introductory econometrics: a modern approach. Mason, Ohio :South-Western Cengage Learning.

**LIBRARY RESOURCES & INFORMATION LITERACY:**

**MAJOR CURRICULUM MODIFICATION**

**Course proposer:** please complete boxes 1-4. **Library faculty subject specialist:** please complete box 5.

|  |  |  |
| --- | --- | --- |
| **1** | **Title of proposal**  Applied Microeconomics | **Department/Program**  Social Science |
|  | **Proposed by** (include email & phone)  Gulgun Bayaz Ozturk  gbayazozturk@citytech.cuny.edu | **Expected date course(s) will be offered**  Spring 2020  **# of students** 20 |

|  |  |
| --- | --- |
| **2** | **The library cannot purchase reserve textbooks for every course at the college, nor copies for all students. Consult our website (<http://cityte.ch/curriculum>) for articles and ebooks for your courses, or our open educational resources (OER) guide (<http://cityte.ch/oer>). Have you considered using a freely-available OER or an open textbook in this course?**  This course will use research or working papers which are available through databases such as EconLit, JStor and PubMed. Students at City Tech enjoy institutional access to full-text journal articles through the databases mentioned above. |
| **3** | **Beyond the required course materials, are City Tech library resources sufficient for course assignments? If additional resources are needed, please provide format details (e.g. ebook, journal, DVD, etc.), full citation (author, title, publisher, edition, date), price, and product link.**  Library resources are sufficient to access the full-text of readings. |

|  |  |
| --- | --- |
| **4** | **Library faculty focus on strengthening students' information literacy skills in finding, critically evaluating, and ethically using information. We collaborate on developing assignments and customized instruction and research guides. When this course is offered, how do you plan to consult with the library faculty subject specialist for your area? Please elaborate.**  This course will require students to complete a term paper, so a handout detailing the steps to search for an article using the library databases, and the steps for appropriate citation of various resources would be great help to our students. |

|  |  |
| --- | --- |
| **5** | **Library Faculty Subject Specialist \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Comments and Recommendations**  **Date** |

**Chancellor’s Report Form**

|  |  |
| --- | --- |
| **Department(s)** | Social Science |
| **Academic Level** | **[ X ] Regular  [   ] Compensatory  [   ] Developmental  [   ] Remedial** |
| **Subject Area** | Data Analytics/Economics |
| **Course Prefix** | ECON |
| **Course Number** | ECON 3401 |
| **Course Title** | Applied Microeconomics |
| **Catalog Description** | This course introduces students to important social and economic problems in the United States and provides real-world applications of data science. Through leading research in the field of applied microeconomics, students will study how researchers use big data to understand and tackle problems that we currently face in areas such as education, health, environment and justice with a microeconomic perspective. Students will have the opportunity to utilize their knowledge and skills that were obtained previously in courses like statistics, econometrics and machine learning to understand and analyze important social and economic problems of our time. |
| **Prerequisite** | ECON 2401 and ECON 3201 |
| **Corequisite** | None |
| **Pre- or corequisite** |  |
| **Credits** | 3 |
| **Contact Hours** | 3 class hours |
| **Liberal Arts** | **[ X ] Yes  [   ] No** |
| **Course Attribute (e.g. Writing Intensive, etc)** |  |
| **Course Applicability** | **[ X ] Major**  **[ ] Gen Ed Required [ ] Gen Ed - Flexible [ ] Gen Ed - College Option**  **[ ] English Composition [ ] World Cultures [ ] Speech**  **[ ] Mathematics [ ] US Experience in its Diversity [ ] Interdisciplinary**  **[ ] Science [ ] Creative Expression [ ] Advanced Liberal Arts**  **[ ] Individual and Society**  **[ ] Scientific World** |
| **Effective Term** | Spring 2020 |

**Rationale:** This course will be one of the applied courses offered by Data Analytics/Economics program at the Social Science department, and it will provide the opportunity to study economic and social applications of large-data statistical models and traditional econometric techniques through frontier research in applied microeconomics. Students will have the chance to utilize their big data skills to understand and analyze the economic and social challenges that the U.S. is facing.

## D.7 ECON 3101 Applied Macroeconomics

**ECON 3101**: Applied Macroeconomics

CURRICULUM MODIFICATION PROPOSAL FORM

This form is used for all curriculum modification proposals. See the [Proposal Classification Chart](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Proposal_Classification_Chart.pdf) for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.

|  |  |
| --- | --- |
| **Title of Proposal** | ECON 3101 Applied Macroeconomics |
| **Date** | August 20, 2018 |
| **Major or Minor** | Major |
| **Proposer’s Name** | Unurjargal Nyambuu |
| **Department** | Social Science |
| **Date of Departmental Meeting in which proposal was approved** | November 1, 2018 |
| **Department Chair Name** | Peter Parides |
| **Department Chair Signature and Date** | Chair approved this as part of overall proposal. |
| **Academic Dean Name** | Justin Vazquez-Poritz |
| **Academic Dean Signature and Date** | Picture 22 1/27/19 |
| **Brief Description of Proposal**  (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body. | This proposal provides the justification for developing ECON 3101 as a required course in the Data Analytics – Economics program in the Department of Social Science. |
| **Brief Rationale for Proposal**  (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body). | This course builds upon the knowledge covered in the intermediate macroeconomics class and applies macroeconomic theories and tools to explain specific topics. In particular, monetary, fiscal, and trade policies will be evaluated, and their consequences will be analyzed. Methodologies for exploiting large high-dimensional data sets for monitoring and forecasting economic conditions in real time, aka “nowcasting” are presented. Dynamic factor models (DFMs) and Bayesian vector autoregression (BVAR) are covered. In addition to using empirical methods learned in advanced econometrics, students will be introduced to numerical and computational methods specifically designed for applied macroeconomics, e.g., nonlinear methods. This course provides a valuable foundation for further research that can be part of an independent research project or internship. The course will complement the Data Analytics – Economics program in the Social Science Department and will be required for students in that major. |
| **Proposal History**  (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list). | This is a first submission. |

**ALL PROPOSAL CHECK LIST**

|  |  |
| --- | --- |
| Completed CURRICULUM MODIFICATION FORM including: |  |
| * Brief description of proposal | X |
| * Rationale for proposal | X |
| * Date of department meeting approving the modification | X |
| * Chair’s Signature | X |
| * Dean’s Signature | X |
| Evidence of consultation with affected departments  List of the programs that use this course as required or elective, and courses that use this as a prerequisite. | X |
| Documentation of Advisory Commission views (if applicable). | N/A |
| Completed [Chancellor’s Report Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Chancellor_Report_Quick_Reference_Guide1.doc). | X |

**EXISTING PROGRAM MODIFICATION PROPOSALS**

|  |  |
| --- | --- |
| Documentation indicating core curriculum requirements have been met for new programs/options or program changes. |  |
| Detailed rationale for each modification (this includes minor modifications) |  |

New York City College of Technology, CUNY

NEW COURSE PROPOSAL FORM

This form is used for all new course proposals. Attach this to the [Curriculum Modification Proposal Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-10-Curriculum_Modification_Proposal_Form.docx) and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

|  |  |
| --- | --- |
| **Course Title** | Applied Macroeconomics |
| **Proposal Date** | August 20, 2018 |
| **Proposer’s Name** | Unurjargal Nyambuu |
| **Course Number** | ECON 3101 |
| **Course Credits, Hours** | 3 |
| **Course Pre / Co-Requisites** | ECON 2101, ECON 3201 |
| **Catalog Course Description** | This course introduces applications of macroeconomic theory and principles to topical issues. Introduces numerical methods used in modern macroeconomic research, and the application of models to big datasets. Provides students the ability to construct and estimate models, and to develop complex relationships between economic aggregates. Applies methods and results in the evaluation of fiscal, monetary, and trade policy. Using the empirical and computational techniques of modern Data Science, monitoring of macroeconomic conditions, drivers of long-term sustainable growth, policy shocks, business cycles, and optimal debt are discussed. |
| **Brief Rationale**  Provide a concise summary of why this course is important to the department, school or college. | This course builds upon the knowledge covered in the intermediate macroeconomics class and applies macroeconomic theories and tools to explain specific topics. In particular, monetary, fiscal, and trade policies will be evaluated, and their consequences will be analyzed. Methodologies for exploiting large high-dimensional data sets for monitoring and forecasting economic conditions in real time, aka “nowcasting” are presented. Dynamic factor models (DFMs) and Bayesian vector autoregression (BVAR) are covered. In addition to using empirical methods learned in advanced econometrics, students will be introduced to numerical and computational methods specifically designed for applied macroeconomics, e.g., nonlinear methods. This course provides a valuable foundation for further research that can be part of an independent research project or internship. The course will complement the Data Analytics – Economics program in the Social Science Department and will be required for students in that major. |
| **CUNY – Course Equivalencies**  Provide information about equivalent courses within CUNY, if any. | Similar courses are offered at the CUNY colleges including:  Graduate Center: ECON 82400 Applied Macro-econometrics |
| **Intent to Submit as Common Core**  If this course is intended to fulfill one of the requirements in the common core, then indicate which area. | No |
| **For Interdisciplinary Courses:**   * Date submitted to ID Committee for review * Date ID recommendation received   - Will all sections be offered as ID? Y/N | N/A |
|  |
|  |
| **Intent to Submit as a Writing Intensive Course** | N/A |

**NEW COURSE PROPOSAL CHECK LIST**

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

|  |  |
| --- | --- |
| **Completed NEW COURSE PROPOSAL FORM** |  |
| * Title, Number, Credits, Hours, Catalog course description | X |
| * Brief Rationale | X |
| * CUNY – Course Equivalencies | X |
| Completed [Library Resources and Information Literacy Form](https://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/curriculum_modification_library_form-rev3F16.doc) | X |
| **Course Outline**  Include within the outline the following. |  |
| Hours and Credits for Lecture and Labs  If hours exceed mandated Carnegie Hours, then rationale for this | X |
| Prerequisites/Co- requisites | X |
| Detailed Course Description | X |
| Course Specific Learning Outcome and Assessment Tables   * Discipline Specific * General Education Specific Learning Outcome and Assessment Tables | X |
| Example Weekly Course outline | X |
| Grade Policy and Procedure | X |
| Recommended Instructional Materials (Textbooks, lab supplies, etc.) | X |
| Library resources and bibliography | X |
| **Course Need Assessment.**  Describe the need for this course. Include in your statement the following information. |  |
| Target Students who will take this course. Which programs or departments, and how many anticipated?  Documentation of student views (if applicable, e.g. non-required elective). | X |
| Projected headcounts (fall/spring and day/evening) for each new or modified course. | X |
| If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction. | X |
| Where does this course overlap with other courses, both within and outside of the department? | X |
| Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this? | X |
| If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need. | N/A |
| **Course Design**  Describe how this course is designed. |  |
| Course Context (e.g. required, elective, capstone) | X |
| Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)? | X |
| Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture) | X |
| How does this course support Programmatic Learning Outcomes? | X |
| Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program. | N/A |
| **Additional Forms for Specific Course Categories** |  |
| [Interdisciplinary Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/Application-for-Interdisciplinary-Course-Designation.docx) (if applicable) | N/A |
| Interdisciplinary Committee Recommendation (if applicable and if received)\*  \*Recommendation must be received before consideration by full Curriculum Committee | N/A |
| [Common Core (Liberal Arts) Intent to Submit](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/CommonCoreCourseSubmissionForm_4.2.12.doc) (if applicable) | N/A |
| Writing Intensive Form if course is intended to be a WIC (under development) | N/A |
| If course originated as an experimental course, then results of evaluation plan as developed with director of assessment. | N/A |
| **(Additional materials for [Curricular Experiments](http://www.300jaystreet.com/college-council/curriculum_proposals/curricular-experiments))** |  |
| Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information). |  |
| Established Timeline for Curricular Experiment |  |

**Proposed Course Name: Applied Macroeconomics**

**Course Overview & Rationale**

The course provides applied knowledge of macroeconomics and computational methods for students who have previously taken courses in Intermediate Macroeconomics and Advanced Econometrics. Theories and tools will be developed to explain specific issues and analyze the performance of economic policies. Students will learn skills and gain knowledge of major quantitative methods and tools used in applying macroeconomics to real situations. Data Science methodologies for monitoring economic conditions in real time and forecasting, e.g., “nowcasting,” are covered. Presented models for handling big datasets include Dynamic Factor Models (DFMs) and Bayesian Vector Auto-Regression (BVAR). In addition to using the techniques learned in Advanced Econometrics, e.g., univariate and multivariate time series, and skills gained in mathematics and computer science courses, students will learn and apply numerical and computational methods specifically designed for applied macroeconomics. These include nonlinear methods. A working knowledge of differential equations, optimization techniques, multi-variable calculus, and probability theory/stochastic processes is recommended. All required mathematics will be developed in the class. This course serves as a research foundation for students who will conduct independent research projects in the field of applied macroeconomics. Also, analytical skills and computational techniques obtained in this course will be useful for students completing internships. Thus, students are required to take this course towards the end of their 4-year program. The course is integral to the proposed Bachelor of Science in Data Analytics – Economics program of the Social Science department.

**Course need**: Students who would take this class: this is a required course for students who intend to major in Data Analytics in Economics

**Department:** Social Science

**Program**: Bachelor of Science in Data Analytics/Economics

**The number of section (s) anticipated**: one section for the third/fourth year

**Projected headcount**: 20 students

**Physical resources required**: Basic smart room set**-**up**:** a screen, and an overhead projector/a TV set that is run by and connected to a computer. The computer will need certain software installed including R, Stata, and Matlab.

**Course overlap**: While ECON 2101 (Intermediate Macroeconomics) is focused on the theory of macroeconomics, ECON 3101 (Applied Macroeconomics) will explore different applications and methodologies for its application.

**Faculty qualified for teaching this course**: Yes, there are faculty members who are qualified to teach this course.

**Course design**

**Course context**: This course will be required of students in the Data Analytics/Economics major. Students are required to complete homework assignments, take a midterm exam, and develop a research project which will culminate in a final presentation at the end of the semester.

**Course structure**: This course will be offered in a lecture style/format.

**Anticipated pedagogical strategies and instructional design**: This class will be run in a lecture-activity style/format. The lectures will provide the knowledge on applied side of the theory and the environment to discuss critical issues in macroeconomics. Quantitative methods and techniques used in selected research will be discussed in class. Creative in-class activities and discussions on the subject between the instructor and students will be organized.

**Providing support to programmatic learning outcomes**: This course requires satisfactory completion of homework assignments, midterm exam, and a final term project/presentation.

NEW YORK CITY COLLEGE OF TECHNOLOGY

The City University of New York

Department of Social Science

ECON 3101 (3 Class Hours, 3 Credits)

Applied Macroeconomics

ECON 3101: Applied Macroeconomics

PREREQUISITE: ECON 2101, ECON 3201

**CATALOG DESCRIPTION:** This course introduces applications of macroeconomic theory and principles to topical issues. Introduces numerical methods used in modern macroeconomic research, and the application of models to big datasets. Provides students the ability to construct and estimate models, and to develop complex relationships between economic aggregates. Applies methods and results in the evaluation of fiscal, monetary, and trade policy. Using the empirical and computational techniques of modern Data Science, monitoring of macroeconomic conditions, drivers of long-term sustainable growth, policy shocks, business cycles, and optimal debt are discussed.

**COURSE TEXT:**

Kevin D. Hoover. 2012. Applied Intermediate Macroeconomics. Cambridge University Press.

**Recommended Text:**

John Cochrane (Chicago), [Time Series for Macroeconomics and Finance](http://faculty.chicagogsb.edu/john.cochrane/research/Papers/time_series_book.pdf), available at <http://econ.lse.ac.uk/staff/wdenhaan/teach/cochrane.pdf>

Additional reading material in particular research papers and reports will be assigned each week. The instructor will provide students with lecture notes*.*

***Online data and information resources:***

Federal Reserve Economic Data (FRED), <https://fred.stlouisfed.org/>

Federal Reserve Bank, <https://www.federalreserve.gov/>

U.S. Bureau of Economic Analysis (BEA),<https://www.bea.gov/>

U.S. Bureau of Labor Statistics*,* <https://www.bls.gov/>

U.S. Census Bureau, <https://www.census.gov/en.html>

The [National Bureau of Economic Research](http://www.nber.org/data/), <http://www.nber.org/>

World Development Indicators by The World Bank, <https://data.worldbank.org/products/wdi>

International Financial Statistics by IMF, <https://www.imf.org/en/Data>

Data.gov [http://data.gov](http://data.gov/)

ScienceDirect <https://www.sciencedirect.com/>

Enterprise Surveys <http://www.enterprisesurveys.org/>

**COURSE INTENDED LEARNING OUTCOMES/ASSESSMENT METHODS**

Upon completion of the course, students will be able to address the following key discipline issues:

|  |  |
| --- | --- |
| **Learning Outcomes** | **Assessment Methods** |
| Develop quantitative skills needed for the empirical research in macroeconomics and apply methods and findings to selected topics in applied macroeconomics; estimate models using empirical techniques; obtain results; provide ability to analyze and critically evaluate macroeconomic policy and recommend options. | Problem sets in homework and on midterm exam; short essay questions on midterm exam; classroom discussions; a term project and an oral presentation. |
| Apply macroeconomic theory and tools to identify the determinants of economic growth in the long run; learn methods of monitoring economic conditions in real time; correct non-stationarity in data; construct a relevant model and estimate it using applied econometrics; identify principal components; test and forecast. | Problem sets in homework and on midterm exam; short essay questions on midterm exam; classroom discussions; a term project and an oral presentation. |
| Build a dynamic growth model and modify it along different dimensions that impact sustainability; demonstrate knowledge of methods, e.g., nonlinear methods, in solving dynamic optimization problem and interpret the results. | Questions on midterm exam; classroom discussions; a term project and an oral presentation. |
| Enhance understanding of how dynamic effects of monetary, fiscal, and trade policy shocks are measured; evaluate vector autoregressive (VARs) models, impulse response of output and prices to policy shocks, use multivariate co-integration method for interactions between policies. | Short essay question on midterm exam; classroom discussions; a term project and an oral presentation. |
| Apply theory on exchange rate determination; assess exchange rate volatility using a generalized autoregressive conditional heteroscedastic model (GARCH). | Problem sets in homework and on midterm exam; short essay questions on midterm exam; classroom discussions; a term project and an oral presentation. |
| Enhance understanding of how macroeconomic theory is connected to real-world issues. Analyze real data, e.g., interest rates, money supply, real estate prices, inflation, and exchange rates. | Short essay question on midterm exam; classroom discussions; a term project and an oral presentation. |

**GENERAL EDUCATION LEARNING OUTCOMES/ASSESSMENT METHODS**

|  |  |
| --- | --- |
| **General Education Outcomes** | **Assessment Methods** |
| **1. KNOWLEDGE:**  Develop knowledge from a range of disciplinary perspectives, and develop the ability to deepen and continue learning. | 1. Short answer questions on midterm exam; problem sets in homework; classroom discussions; a term project and an oral presentation. |
| **2. SKILLS:**  Develop and use the tools needed for communication, inquiry, analysis, and productive work. | 1. Short answer questions on midterm exam; problem sets in homework; classroom discussions; a term project and an oral presentation. |
| **3. INTEGRATION:**  Work productively within and across disciplines. | 1. Short answer questions on midterm exam; problem sets in homework; a term project and an oral presentation. |
| **4. VALUES, ETHICS, AND RELATIONSHIPS:**  Understand and apply values, ethics, and diverse perspectives in personal, civic, and cultural/global domains. | 1. Class discussion; teamwork, term project and oral presentation. |

**SCOPE OF ASSIGNMENTS**

There will be three homework assignments including problem sets that will build quantitative skills during the semester; a midterm exam; a term project involving some outside research and preparing a research paper (8-10 pages) that requires applying relevant theory or building a model, gathering and analyzing of data and related information, using empirical methodology, interpreting the results, and/or proposing policy options, and an oral presentation.

**METHOD OF EVALUATION** – elements and weight of factors determining the students’ grade

|  |  |
| --- | --- |
| Homework assignments | 30% |
| Midterm Exam | 30% |
| Term project/presentation | 40% |
| Total | 100% |

**GRADE SCALE:**

|  |  |  |  |
| --- | --- | --- | --- |
| 93 – 100 = A  90 - 92.9 = A- | 87 - 89.9 = B+  83 - 86.9 = B  80 - 82.9 = B- | 77 - 79.9 = C+  70 - 76.9 = C | 60 - 69.9 = D  0 - 59.9 = F |

***Course Outline:***

|  |  |  |
| --- | --- | --- |
| **Week** | **Topics** | **Assignment/Reading\*** |
| 1 | **Introduction and Overview**   * 1. Macroeconomics and the Real World   2. International Economic Accounts | U.S. BEA; International Accounts; Kuznets; Hoover (2012). |
| 2 | **National –Income-and-Product Account (NIPA)**   1. National Accounting Identities   Building the National –Income-and-Product Account (NIPA) based on Patterns in Data | U.S. BEA: NIPA Guide and Data; Hoover (2012). |
| 3 | **Determinants of Long-term Economic Growth**   1. Applications of Theory; Constructing Models 2. Method: Applied Econometrics | Mankiw, Romer, Weil (1992); Fischer (1993); Lane (2001); Hoover (2012). |
| 4 | **Growth Models and their Modification; Sustainable Growth and Open Economies**   1. Applications of Theory; Constructing a Model and its Variants 2. Numerical Solution with Nonlinear Methods | Meerschaert (2007); Gruene & Pannek (2011); Hoover (2012). |
| 5 | **Measuring the Effects of Monetary Policy; Monetary Policy Shocks**   1. Applications of Theory 2. Method: Multivariate time series (Bayesian Vector Autoregressions (VARs), Impulse Response, Sensitivity Analysis of Parameters, Variance Decompositions, Co-integration); 3. Method: Dynamic Factor Models | Leeper, Sims, Zha (1996); Bernanke, Boivin, Eliasz (2005); Hoover (2012). |
| 6 | **Effects of Government Purchases and Taxes; Fiscal Policy Shocks; Fiscal multipliers.**   1. Applications of Theory 2. Method: Multivariate Time Series (Vector Autoregressions (VARs), Impulse Response, Variance Decompositions, Co-integration) | Mountford & Uhlig (2009); Barro & Redlick (2011); Hoover (2012). |
| 7 | **Monitoring Macroeconomic Conditions and Forecasting using Large Datasets**   1. Review of Methods 2. The Federal Reserve Bank Method of *Now*casting 3. Dynamic Factor Models for handling Large Data Sets | Giannone et al. (2008); Bok (2017); |
| 8 | **Phillips Curve: U.S. Inflation and Unemployment**   1. Applications of Theory 2. Method: Applied Econometrics | Andrle (2012); Blanchard (2016); Hoover (2012). |
| 9 | **Midterm Exam\*\*** |  |
| 10 | **Measuring the Effects of Trade Policy**   1. Applications of Theory 2. Method: Applied Econometrics | Edwards (1993), Harrison (1995). |
| 11 | **Exchange Rate Determination**   1. Application of Theory: Purchasing Power Parity 2. Application of Theory: The Uncovered Parity Approach 3. Application of Theory: The Monetary Approach, and others 4. Method: Multivariate Time Series (Vector Autoregressions (VARs), Impulse Response, Variance Decompositions, Co-integration) | Mundell (1963); Bilson (1978); Mishkin (1984); Engle & Granger (1987); Meese & Rogoff (1988); Froot & Rogoff (1994); Eichenbaum & Evans (1995); Groen (2000); Bilson & Marston (2007). |
| 12 | **Exchange Rate Volatility**   1. Applications of Theory 2. Method: Auto-Regressive Conditional Heteroscedastic Model (ARCH) and GARCH 3. Method: Monte Carlo Methods | Bollerslev (1990); Engle (2001); Bilson & Marston (2007). |
| 13 | **Debt Effect on Economic Growth, Excess Debt, and Optimal Debt**   1. Applications of Theory 2. Method: Mean-Variance Approach 3. Method: Applied Econometrics 4. Method: Nonlinear Methods | Pattillo et al. (2002); Stein (2005); Meerschaert (2007); Caner et al. (2010); Cecchetti et al. (2011). |
| 14 | **The Business Cycle and the Economy; Technology Shocks**   1. Applications of Theory 2. Identifying Business Cycle based on Patterns in Data 3. Method: Principal Component Analysis | Ireland (2004); Andrle et al. (2017); Hoover (2012). |
| 15 | ***Term Project/Presentation*** |  |

*\* Assignment/reading is subject to change.*

*\*\*Exam date is subject to change.*

**ACADEMIC INTEGRITY POLICY**

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

**STATEMENT ON STUDENTS WITH DISABILITY:**

Qualified students with disabilities will be provided reasonable academic accommodations if determined eligible by the Center for Students Accessibility (CSA). Prior to granting a disability accommodation in this course, the instructor must receive written verification of a student’s eligibility from CSA, which is located in Room L-237 (<http://www.citytech.cuny.edu/accessibility/>). It is the student’s responsibility to initiate contact with the CSA staff and to follow the established procedures for having the accommodation notice sent to the instructor.

**SELECT BIBLIOGRAPHY:**

Andrle, M. 2012. Cheers to Good Health of the US Phillips Curve: 1960–2012. Technical report, IMF.

Andrle M., Brůha, J., Solmaz, S. 2017. On the sources of business cycles: implications for DSGE models. ECB working paper. No. 2058. <https://www.ecb.europa.eu/pub/pdf/scpwps/ecb.wp2058.en.pdf?911a7a9596dac1b5db11a26e1bc8bfa6>

Barro R.J. & Redlick, C.J. 2011. Macroeconomic effects from government purchases and taxes. The Quarterly Journal of Economics, 126(1): 51–102.

Bernanke B.S., Boivin, J., Eliasz, P. 2005. Measuring the effects of monetary policy: A factor-augmented vector autoregressive (FAVAR) approach. The Quarterly Journal of Economics, 120(1):387–422.

Bilson, [J.F.O.](http://www.jstor.org.central.ezproxy.cuny.edu:2048/action/doBasicSearch?hp=25&so=rel&wc=off&fc=off&Query=au:%252522John+F.+O.+Bilson%252522&si=1), 1978. The Monetary Approach to the Exchange Rate: Some Empirical Evidence. Staff Papers (IMF), Vol. 25, No. 1, pp. 48-75.

Bilson, J.F.O. & Marston, R.C. 2007. Exchange Rate Theory and Practice. Chicago: University of Chicago Press.

Blanchard O. 2016. The Phillips Curve: Back to the '60s?. American Economic Review, 106(5), 31-34.

Blanchard O. & Perotti, R. 2002. An empirical characterization of the dynamic effects of changes in government spending and taxes on output. The Quarterly Journal of Economics, 117(4):1329–68.

Bok, B., Caratelli, D., Giannone, D., Sbordone, A., Tambalotti, A. 2017. Macroeconomic Nowcasting and Forecasting with Big Data. Federal Reserve Bank of New York Staff Reports, no. 830. https://www.newyorkfed.org/medialibrary/media/research/staff\_reports/sr830.pdf.

Bollerslev T. 1990. Modelling the Coherence in Short-Run Nominal Exchange Rates: A Multivariate Generalized Arch Model. The Review of Economics and Statistics, Vol. 72, No. 3, pp. 498-505

Caner, M., T. Grennes, F. Koehler-Geib. 2010. Finding the Tipping Point—When Sovereign Debt Turns Bad. World Bank Policy Research Working Paper No. 5391. Washington DC: World Bank.

Cecchetti, S., M. Mohanty, and F. Zampolli. 2011. The Real Effects of Debt. Bank for International Settlements Working Paper No. 352. <http://www.bis.org/publ/work352.htm>.

Edwards, S. 1993, Trade Policy, Exchange Rates and Growth, National Bureau of Economic Research Working Paper No. 4511. <http://www.nber.org/chapters/c7649.pdf>

Eichenbaum, M. & C. Evans (1995) “Some empirical evidence on the effects of shocks to monetary policy on exchange rates”, The Quarterly Journal of Economics, 110, 4, 975-1009.

Engle, R.F., Granger, C.W.J., 1987. Co-integration and error correction: representation, estimation and testing. Econometrica 55, 251–276.

Engle R. 2001. GARCH 101: The Use of ARCH/GARCH Models in Applied Econometrics. The Journal of Economic Perspectives Vol. 15, No. 4, pp. 157-168.

Feldstein, M. & Horioka, C. 1980. “Domestic Saving and International Capital Flows,” Economic Journal, 90(2), pp. 314-329.

Fischer S. 1993, The Role of Macroeconomic Factors in Growth, NBER Working Paper #4256. <http://www.nber.org/papers/w4565>

Froot, A.K., Rogoff, K., 1994. Perspectives on PPP and long-run real exchange rates. NBER. <http://www.nber.org/papers/w4952.pdf>

Garín J, Lester, R. Sims, E. Intermediate Macroeconomics, manuscript (open to public, obtain the latest version from: <https://www3.nd.edu/~esims1/gls_textbook.html>).

Giannone, D., Reichlin, L., Small, D. 2008. Nowcasting: The real-time informational content of macroeconomic data. Journal of Monetary Economics, 55 (4), 665–676.

Groen, J.J.J., 2000. The Monetary Exchange Rate Model as a Long-run Phenomenon. Journal of International Economics 52: 299–319.

Gruene L. &. Pannek J. 2011. Nonlinear Model Predictive Control: Theory and Algorithms. Springer.

Harrison, A. 1995. Openness and Growth: A Time-Series, Cross-Country Analysis for Developing Countries. NBER Working Paper No. 5221, August; Journal of Development Economics.

Hoover D.K. 2012. Applied Intermediate Macroeconomics. Cambridge University Press.

Ireland P. 2004. “Technology shocks in the New Keynesian model,” Review of Economics and Statistics, 2004, Vol. 86(4), pp.923-936.

Lane, P.R. 2001. The New Open Economy Macroeconomics: A Survey, Journal of International Economics 54:2, 235-266.

Leeper, E., C. Sims, and T. Zha (1996) “What does monetary policy do”, Brookings Paper on Economic Activity, 2, 1-79.

Mankiw, G.N., Romer, D., Weil, D. 1992. A Contribution to the Empirics of Economic Growth, Quarterly Journal of Economics 107, 407-437.

Mishkin, F.S., 1984. Are real interest rates equal across countries? An empirical investigation of international parity conditions. Journal of Finance 39, 1345–1357.

Meerschaert, M.M., 2007. Mathematical Modeling. 4th edition. San Diego, CA: Academic Press.

Mountford A. & Uhlig, H. 2009. What are the effects of fiscal policy shocks? Journal of Applied Econometrics, 24(6): 960–992.

Mundell, R.A. 1963. Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates, Canadian Journal of Economics and Political Science 29: 475-485.

Pattillo C, Poirson H, Ricci L. 2002. External Debt and Growth, IMF Working Paper 02 /69. International Monetary Fund: Washington. http://www.imf.org/external/pubs/ft/wp/2002/wp0269.pdf.

Stein. J. 2005. Applications of stochastic optimal control/dynamic programming to international finance and debt crises. Nonlinear Analysis 63(5-7): e2033-e2041.

U.S. BEA. A Guide to the National Income and Product Accounts of the United States. <https://www.bea.gov/national/pdf/nipaguid.pdf>.

U.S. BEA. NIPA Data. <https://www.bea.gov/iTable/index_nipa.cfm>.

**LIBRARY RESOURCES & INFORMATION LITERACY: MAJOR CURRICULUM MODIFICATION**

Consult with your library faculty subject specialist (<http://cityte.ch/dir>) **3 weeks before the proposal deadline**.

**Course proposer:** please complete boxes 1-4. **Library faculty subject specialist:** please complete box 5.

|  |  |  |
| --- | --- | --- |
| **1** | **Title of proposal**  Econ 3101 Applied Macroeconomics | **Department/Program**  Social Science/Data Analytics-Economics |
|  | **Proposed by** (include email & phone)  Unurjargal Nyambuu [unyambuu@citytech.cuny.edu](mailto:unyambuu@citytech.cuny.edu)  Tel: 718-260-5059 | **Expected date course(s) will be offered**  Spring 2020  **# of students** 20 |

|  |  |
| --- | --- |
| **2** | **The library cannot purchase reserve textbooks for every course at the college, nor copies for all students. Consult our website (<http://cityte.ch/curriculum>) for articles and *e*books for your courses, or our open educational resources (OER) guide (<http://cityte.ch/oer>). Have you considered using a freely-available OER or an open textbook in this course?**  Textbook by Kevin D. Hoover (2012, Applied Intermediate Macroeconomics) published by Cambridge University Press is required. Most of the resources/readings for the course are available to students through the library. Older editions of the books are acceptable. |

|  |  |
| --- | --- |
| **3** | **Beyond the required course materials, are City Tech library resources sufficient for course assignments? If additional resources are needed, please provide format details (e.g. *e*book, journal, DVD, etc.), full citation (author, title, publisher, edition, date), price, and product link.**  Yes. The other resources, including the manuscript John Cochrane (Chicago), [Time Series for Macroeconomics and Finance](http://faculty.chicagogsb.edu/john.cochrane/research/Papers/time_series_book.pdf), available at <http://econ.lse.ac.uk/staff/wdenhaan/teach/cochrane.pdf>  The library also has the book on: Meerschaert, M.M., 2007. Mathematical Modeling. 4th edition. San Diego, CA: Academic Press. |

|  |  |
| --- | --- |
| **4** | **Library faculty focus on strengthening students' information literacy skills in finding, critically evaluating, and ethically using information. We collaborate on developing assignments and customized instruction and research guides. When this course is offered, how do you plan to consult with the library faculty subject specialist for your area? Please elaborate.**  This course requires students to read and cite research articles and other related material in their homework assignment and a final project. A workshop on how to search for different resources and how to properly cite the resources would be very helpful. |

|  |  |
| --- | --- |
| **5** | **Library Faculty Subject Specialist \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Comments and Recommendations**  **Date** |

**Chancellor’s Report Form**

|  |  |
| --- | --- |
| **Department(s)** | Social Science |
| **Academic Level** | **[ X ] Regular  [   ] Compensatory  [   ] Developmental  [   ] Remedial** |
| **Subject Area** | Data Analytics/Economics |
| **Course Prefix** | ECON |
| **Course Number** | ECON 3101 |
| **Course Title** | Applied Macroeconomics |
| **Catalog Description** | This introduces applications of macroeconomic theory and principles to topical issues. Introduces numerical methods used in modern macroeconomic research, and the application of models to big datasets. Provides students the ability to construct and estimate models, and to develop complex relationships between economic aggregates. Applies methods and results in the evaluation of fiscal, monetary, and trade policy. Using the empirical and computational techniques of modern Data Science, monitoring of macroeconomic conditions, drivers of long-term sustainable growth, policy shocks, business cycles, and optimal debt are discussed. |
| **Prerequisite** | ECON 2101, ECON 3201 |
| **Corequisite** | None |
| **Pre- or corequisite** |  |
| **Credits** | 3 |
| **Contact Hours** | 3 class hours |
| **Liberal Arts** | **[ X ] Yes  [   ] No** |
| **Course Attribute (e.g., Writing Intensive, etc.)** |  |
| **Course Applicability** | **[ X ] Major**  **[ ] Gen Ed Required [ ] Gen Ed - Flexible [ ] Gen Ed - College Option**  **[ ] English Composition [ ] World Cultures [ ] Speech**  **[ ] Mathematics [ ] US Experience in its Diversity [ ] Interdisciplinary**  **[ ] Science [ ] Creative Expression [ ] Advanced Liberal Arts**  **[ ] Individual and Society**  **[ ] Scientific World** |
| **Effective Term** | Spring 2020 |

**Rationale:** This course builds upon the knowledge covered in the intermediate macroeconomics class and applies macroeconomic theories and tools to explain specific topics. In particular, monetary, fiscal, and trade policies will be evaluated, and their consequences will be analyzed. Methodologies for exploiting large high-dimensional datasets for monitoring and forecasting economic conditions in real time, aka “nowcasting” are presented. Dynamic factor models (DFMs) and Bayesian vector autoregression (BVAR) are covered. In addition to using empirical methods learned in advanced econometrics, students will be introduced to numerical and computational methods specifically designed for applied macroeconomics. This course provides a valuable foundation for further research that can be part of an independent research project or internship. The course will complement the Data Analytics – Economics program in the Social Science Department and will be required for students in that major.

## D.8 ECON 3301Visualizing and Mapping Economic Data

**ECON 3301**: Visualizing and Mapping Economic Data

CURRICULUM MODIFICATION PROPOSAL FORM

This form is used for all curriculum modification proposals. See the [Proposal Classification Chart](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Proposal_Classification_Chart.pdf) for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.

|  |  |
| --- | --- |
| **Title of Proposal** | ECON 3301 Visualizing and Mapping Economic Data |
| **Date** | July 16, 2018 |
| **Major or Minor** | Major |
| **Proposer’s Name** | Sean P. Macdonald |
| **Department** | Social Science |
| **Date of Departmental Meeting in which proposal was approved** | November 1, 2018 |
| **Department Chair Name** | Peter Parides |
| **Department Chair Signature and Date** | Chair approved this as part of overall proposal. |
| **Academic Dean Name** | Justin Vazquez-Poritz |
| **Academic Dean Signature and Date** | Picture 25 1/27/19 |
| **Brief Description of Proposal**  (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body. | This proposal provides the rationale for developing ECON 3301 as a required course in the Data Analytics – Economics program in the Department of Social Science. |
| **Brief Rationale for Proposal**  (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body). | The course will introduce students to the importance of using visualization techniques to communicate key information, identify trends, and to develop and write critical analyses. The ability to visually present and map data and to use these techniques to convey information is important. The course will complement the Data Analytics in Economics program in the Social Science Department and will be required of students in the major. |
| **Proposal History**  (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list). | This is a first submission. |

**ALL PROPOSAL CHECK LIST**

|  |  |
| --- | --- |
| Completed CURRICULUM MODIFICATION FORM including: |  |
| * Brief description of proposal | X |
| * Rationale for proposal | X |
| * Date of department meeting approving the modification | X |
| * Chair’s Signature | X |
| * Dean’s Signature | X |
| Evidence of consultation with affected departments  List of the programs that use this course as required or elective, and courses that use this as a prerequisite. | X |
| Documentation of Advisory Commission views (if applicable). | N/A |
| Completed [Chancellor’s Report Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Chancellor_Report_Quick_Reference_Guide1.doc). | X |

**EXISTING PROGRAM MODIFICATION PROPOSALS**

|  |  |
| --- | --- |
| Documentation indicating core curriculum requirements have been met for new programs/options or program changes. |  |
| Detailed rationale for each modification (this includes minor modifications) |  |

New York City College of Technology, CUNY

NEW COURSE PROPOSAL FORM

This form is used for all new course proposals. Attach this to the [Curriculum Modification Proposal Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-10-Curriculum_Modification_Proposal_Form.docx) and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

|  |  |
| --- | --- |
| **Course Title** | Visualizing and Mapping Economic Data |
| **Proposal Date** | July 16, 2018 |
| **Proposer’s Name** | Sean P. MacDonald |
| **Course Number** | ECON 3301 |
| **Course Credits, Hours** | 3 |
| **Course Pre / Co-Requisites** | ECON 2401 or 2101; CST 1204 |
| **Catalog Course Description** | This course offers an introduction to presenting data visually in maps and charts, with a focus on data analysis in applied contexts including health, labor market, household, demographic, and environmental data. Topics include summarizing and analyzing visualized data and preparing story maps. |
| **Brief Rationale**  Provide a concise summary of why this course is important to the department, school or college. | The course will introduce students to the importance of using visualization techniques to communicate key information, identify trends, and to develop and write critical analyses. The ability to visually present and map data and to use these techniques to convey information is important. The course will complement the Data Analytics in Economics program in the Social Science Department and will be required of students in the major. |
| **CUNY – Course Equivalencies**  Provide information about equivalent courses within CUNY, if any. | None (see comment on CST 3602) |
| **Intent to Submit as Common Core**  If this course is intended to fulfill one of the requirements in the common core, then indicate which area. | No |
| **For Interdisciplinary Courses:**   * Date submitted to ID Committee for review * Date ID recommendation received   - Will all sections be offered as ID? Y/N | N/A |
|  |
|  |
| **Intent to Submit as a Writing Intensive Course** | N/A |

**NEW COURSE PROPOSAL CHECK LIST**

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

|  |  |
| --- | --- |
| **Completed NEW COURSE PROPOSAL FORM** |  |
| * Title, Number, Credits, Hours, Catalog course description | X |
| * Brief Rationale | X |
| * CUNY – Course Equivalencies | X |
| Completed [Library Resources and Information Literacy Form](https://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/curriculum_modification_library_form-rev3F16.doc) | X |
| **Course Outline**  Include within the outline the following. |  |
| Hours and Credits for Lecture and Labs  If hours exceed mandated Carnegie Hours, then rationale for this | X |
| Prerequisites/Co- requisites | X |
| Detailed Course Description | X |
| Course Specific Learning Outcome and Assessment Tables   * Discipline Specific * General Education Specific Learning Outcome and Assessment Tables | X |
| Example Weekly Course outline | X |
| Grade Policy and Procedure | X |
| Recommended Instructional Materials (Textbooks, lab supplies, etc) | X |
| Library resources and bibliography | X |
| **Course Need Assessment.**  Describe the need for this course. Include in your statement the following information. |  |
| Target Students who will take this course. Which programs or departments, and how many anticipated?  Documentation of student views (if applicable, e.g. non-required elective). | X |
| Projected headcounts (fall/spring and day/evening) for each new or modified course. | X |
| If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction. | X |
| Where does this course overlap with other courses, both within and outside of the department? | X |
| Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this? | X |
| If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need. | N/A |
| **Course Design**  Describe how this course is designed. |  |
| Course Context (e.g. required, elective, capstone) | X |
| Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)? | X |
| Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture) | X |
| How does this course support Programmatic Learning Outcomes? | X |
| Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program. | N/A |
| **Additional Forms for Specific Course Categories** |  |
| [Interdisciplinary Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/Application-for-Interdisciplinary-Course-Designation.docx) (if applicable) | N/A |
| Interdisciplinary Committee Recommendation (if applicable and if received)\*  \*Recommendation must be received before consideration by full Curriculum Committee | N/A |
| [Common Core (Liberal Arts) Intent to Submit](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/CommonCoreCourseSubmissionForm_4.2.12.doc) (if applicable) | N/A |
| Writing Intensive Form if course is intended to be a WIC (under development) | N/A |
| If course originated as an experimental course, then results of evaluation plan as developed with director of assessment. | N/A |
| **(Additional materials for [Curricular Experiments](http://www.300jaystreet.com/college-council/curriculum_proposals/curricular-experiments))** |  |
| Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information). |  |
| Established Timeline for Curricular Experiment |  |

Proposed Course Name: Visualizing and Mapping Economic Data

Course Overview & Rationale

Visualizing and Mapping Economic Data focuses on the importance of effectively communicating both visually and in writing, the key trends and information that are revealed in various social, economic and demographic data. Effective written, verbal and visual communication are essential skills in data analytics, and this course focuses on providing students with some critical tools for strengthening such sills. The focus is on data analysis in applied contexts including health, labor market, household, demographic, and environmental data. The course is also integral to the proposed Bachelors of Science in Data Analytics/Economics program of the Social Science department.

This course is designed for students who are already familiar with fundamental economic analysis and concepts introduced in the intermediate and applied Microeconomics and Macroeconomics courses. Students will have also completed many of the core required courses in mathematics and computer information systems. The central learning outcome of this course is for students to be able to communicate important information about data in a visual context, such as in a map. At the same time, they need to be able to convey that information in writing and in summary form. Students much complete a final mapping project and written summary applying the freely available web-based programs and data sets that will be explored in the class. The course will provide students with an overview of the necessary information and intellectual tools to effectively apply the methods of economic analysis to the visualization and assessment of economic and demographic data.

**Course Need**: Students who would take this class: students who intend to major in Data Analytics in Economics

**Department:** Social Science

**Program**: Bachelors of Science in Data Analytics/Economics

**The number of section (s) anticipated**: one section for the first year

**Projected headcount**: 20 students

**Physical Resources required**: Basic smart room set-up: a screen, and an overhead projector.

**Course overlap**: None: CST 3602, (Data Visualization), is focused on the technical aspects of visualization, such as various graphical techniques for presenting data.

**Faculty qualified for teaching this course**: Yes, there are faculty members who are qualified to teach this course.

**Course design**

**Course context**: This course will be required of students in the Data Analytics/Economics major. Students are required to develop a mapping project that will culminate in a final presentation at the end of the semester.

**Course structure**: This course will be offered in a lecture style/format.

**Anticipated Pedagogical Strategies and Instructional Design**: This class will be offered in a lecture-activity-workshop style/format. The class will begin with a lecture, and then move on to creative in-class activities, such as searching and using census, BLS and other data sources, conducting detailed analyses and mapping data.

**Providing Support to Programmatic Learning Outcomes**: This course requires satisfactory completion of individual assignments, a midterm and final exam, and a final project/presentation.

NEW YORK CITY COLLEGE OF TECHNOLOGY

The City University of New York

Department of Social Science

Visualizing and Mapping Economic Data

ECON 3301 (3 Class Hours, 3 Credits)

Visualizing and Mapping Economic Data

ECON 3301: Visualizing and Mapping Economic Data

**CATALOG DESCRIPTION**: This course offers an introduction to presenting data visually in maps and charts, with a focus on data analysis in applied contexts including health, labor market, household, demographic, and environmental data. Topics include summarizing and analyzing visualized data and preparing story maps.

**Course Format**

The first third of the course (sessions 1 – 5) will focus on identifying and effectively searching and filtering data sources including the Census Bureau’s American Community Survey and American Factfinder, Longitudinal data, Employment (Bureau of Labor Statistics), New York City Open Data and New York State Open Data. Other data sources may include FiveThirtyEight <https://data.fivethirtyeight.com/> and Tableau datasets: <https://community.tableau.com/docs/DOC-10635>

In weeks 6 – 10, students will explore mapping tools, including Carto, Census data mapper, and Arc GIS (public version), and data visualization tools with Tableau, creating maps in these applications from various data sources and developing effective analyses and summaries. During weeks 11 – 15, topics will focus on strategies and tools for developing maps that are visually informative and that effectively communicate information and employ a clear economic analysis of the relevant data.

**Course Learning Outcomes and Methods of Assessment**

|  |  |
| --- | --- |
| LEARNING OUTCOMES | ASSESSMENT METHODS |
| 1. Students in the course should be able to demonstrate an understanding of many dimensions of data visualization and mapping as this relates to economic analysis. | 1. The midterm and final exams, which will include essay questions, will test students’ understanding of effective data analysis. |
| 1. Demonstrate an understanding of economic concepts and apply these to succinct analyses of information conveyed in various data. | 2. Class discussions of assigned articles and in class activities/projects that apply various data visualization/mapping techniques |
| 1. Identify a range of tools from economic theory that can be applied to an understanding of specific data in the context of the macroeconomy. | 3. Class activities and discussions will offer the opportunity for students to critically study and make connections between various economic perspectives and an effective analysis of information conveyed in data. |
| 1. Develop a breadth and depth of knowledge of how to apply the tools of mapping to an effective presentation. | 4. Through the final project and presentation, students will focus on a topic/problem and the presentation of that information in a map |

**General Education Learning Outcomes and Methods of Assessment**

|  |  |
| --- | --- |
| LEARNING OUTCOMES | ASSESSMENT METHODS |
| 1. KNOWLEDGE: To develop an understanding of the key concepts that relate to mapping and the visual presentation of data | 1. In class projects and discussion of readings that test an understanding of basic concepts and that require students to express their understanding in writing. |
| 1. SKILLS: Develop and apply the tools of economic analysis to critically question, analyze, and summarize economic data; Develop and strengthen the ability to discuss concepts and thoughts in writing. | 2. Completion of essay questions on exams; class discussions of questions tied to topics and techniques covered in class. |
| 1. INTEGRATION: Apply the tools and analytical approaches acquired in the course to an understanding of the techniques of visually presenting and summarizing information from data. | 3. A final research project that requires students to select and define a topic, problem or issue, searching and examining relevant data, and conveying key information about its meaning and implications; Final in-class presentation and research summary |
| 1. VALUES, ETHICS, AND RELATIONSHIPS: Develop an understanding of and ability to apply diverse perspectives to the analysis of economic data; work creatively with others in group problem solving projects; develop a respect for diverse viewpoints and apply the skills and concepts covered in the course to the analysis of related issues and concepts. | 4. In-class group assignments; assignments encourage student discussion and sharing of ideas and perspectives; focused discussions that encourage students to question and think critically to develop their own perspectives. |

**PREREQUISITES**

ECON 2401 or ECON 2101

**Required text and additional materials**

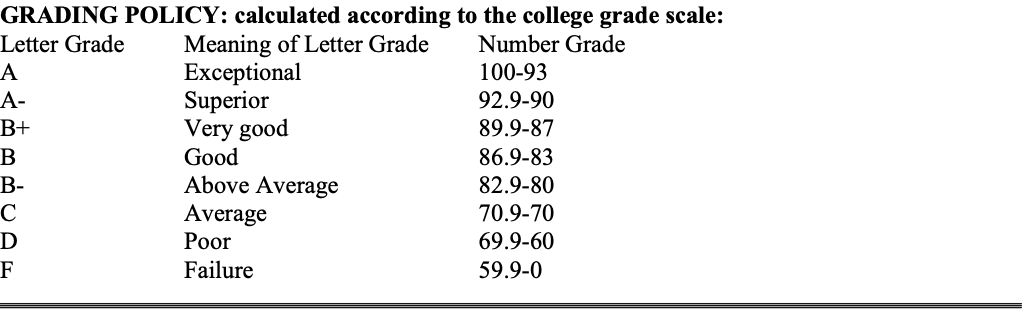
All readings and/or links to assigned readings will be provided. All applications used to map data are freely available online and only require establishing accounts with a user name.

**Scope of assignments**

Students in this course will complete a midterm and final exam; class assignments and assigned readings; and a final project and presentation consisting of a short 2 – 3 - page paper. The midterm and final exams will focus on demonstrating a clear written understanding of key concepts covered in the course and readings; Participation (based upon contributions to class discussions; attendance; timely completion of all assignments) You will be expected to come prepared to discuss assigned questions from the readings.

**METHOD OF GRADING**: elements and weight of factors determining course grade)

|  |  |
| --- | --- |
| 1. Participation: (attendance; contributing to class discussions; timely completion of all assignments | 15% |
| 2. In-class projects | 20% |
| 3. Midterm exam – essay format (in class) | 20% |
| 4. Second exam | 20% |
| 5. Final project: map and data; summary paper; presentation | 25% (summary: 10%; map and data: 10%; presentation: 5% |



**ACADEMIC INTEGRITY**

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

**Course Outline:**

|  |  |  |
| --- | --- | --- |
| **Week** | **Topic** | **Assignment/reading** |
| 1 | Overview and Introduction: working with data; how will data be used? | Reading: Boyd, Danah, and Kate Crawford. 2012. “Critical Questions For Big Data: Provocations for a Cultural, Technological, and Scholarly Phenomenon.” *Information, Communication & Society* 15 (5): 662–79. |
| 2 | Understanding and using U.S. Census data; conducting and refining a search; defining the purpose of your research; using data files and creating charts | Reading: U.S. Census Bureau. 2009 “A Compass for Understanding and Using American Community Survey Data What Researchers Need to Know.”  American Community Survey: <https://www.census.gov/programs-surveys/acs/> |
| 3 | Economic/employment data; and Longitudinal Household and Employment data  Overview of data available from: 1) BLS [www.bls.gov](http://www.bls.gov) - Bureau of Labor Statistics, BEA [www.bea.gov](http://www.bea.gov) Bureau of Economic Analysis, decennial census – [www.census.gov](http://www.census.gov) | Reading: “Socioeconomic Data for Understanding Your Regional Economy: A User’s Guide” Joseph Cortright and Andrew Reamer. Economic Development Administration, U. S. Department of Commerce, 1998 (ch 2 and 3) <http://econdata.net/wp-content/uploads/2014/12/uguide.pdf> |
| 4 | Searching and using open data sources: NYC Open Data, NYS Open Data, NYS Open health data, World Bank open data. | <https://opendata.cityofnewyork.us/>  <https://data.ny.gov/>  <https://www.healthdata.gov/dataset/new-york-state-open-health-data>  <https://data.worldbank.org/> |
| 5 | Data visualization | Using charts and maps to effectively illustrate information and trends |
| 6 | Exam #1 |  |
| 7 | Using Carto to map data: setting up an account; review of the program and data requirements | <https://carto.com/> |
| 8 | Using American Factfinder <https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml>  Using Social Explorer to access and download census data; <https://www.socialexplorer.com/> |  |
| 9 | Using data to inform public policy | Reading: Meg Merrick and Sheila Martin. “Creating and Using Neighborhood Data to Shape a More Equitable Regional Greenspace Policy” Meg Merrick and Sheila Martin. In Kingsley, G. Thomas, Claudia J. Coulton, and Kathryn L.S. Pettit. 2014. *Strengthening Communities with Neighborhood Data*. Washington, DC: Urban Institute, (selected sections).  <https://www.urban.org/sites/default/files/publication/42096/2000115-Strengthening-Communities-with-Neighborhood-Data.pdf> |
| 10 | Using Census data mapper: Using Census Bureau data visualization and mapping tools to illustrate demographic and economic trends; researching demographic and economic trends | Reading: Few, Stephen. 2012. *Show Me the Numbers: Designing Tables and Graphs to Enlighten.* 2nd ed. (selected pages and sections) |
| 11 | Using Google Maps to upload datasets and create maps | <https://www.google.com/maps/d/?page=explore&hl=en> <https://support.google.com/mymaps/answer/3024925?visit_id=1-636670220543056461-2103910031&p=lite_addplaces&rd=1>  [https://www.google.com/maps/d/edit?page=explore&hl=en&mid=1cr6rDQafTqsHETfpUxDz9z0599pAWuZ7&ll=40.73792331115439%2C-73.86601035000001&z=10](https://www.google.com/maps/d/edit?page=explore&hl=en&mid=1cr6rDQafTqsHETfpUxDz9z0599pAWuZ7&ll=40.73792331115439%25252C-73.86601035000001&z=10) |
| 12 | Using ArcGIS (public version) to map and analyze economic data |  |
| 13 | Story Mapping: Using maps to summarize a problem, demographic and economic trends, key findings, and more; structuring a storyline: overview and exploration | Reading: Kheir Al-Kodmany. 2001. “Visualization Tools and Methods for Participatory Planning and Design” Journal of Urban Technology, vol 8. No 2, pp 1 – 37. |
| 14 | Exam #2 |  |
| 15 | Final presentations of maps/stories/summaries |  |
|  |  |  |

**Bibliography:**

1. Kheir Al-Kodmany. 2001. “Visualization Tools and Methods for Participatory Planning and Design” Journal of Urban Technology, vol 8. No 2, pp 1 – 37
2. Few, Stephen. 2012. *Show Me the Numbers: Designing Tables and Graphs to Enlighten.* 2nd ed.
3. Meg Merrick and Sheila Martin. In Kingsley, G. Thomas, Claudia J. Coulton, and Kathryn L.S. Pettit. 2014. *Strengthening Communities with Neighborhood Data*. Washington, DC: Urban Institute
4. Joseph Cortright and Andrew Reamer “Socioeconomic Data for Understanding Your Regional Economy: A User’s Guide” Economic Development Administration, U. S. Department of Commerce, 1998
5. U.S. Census Bureau. 2009 “A Compass for Understanding and Using American Community Survey Data What Researchers Need to Know.”
6. Boyd, Danah, and Kate Crawford. 2012. “Critical Questions For Big Data: Provocations for a Cultural, Technological, and Scholarly Phenomenon.” *Information, Communication & Society* 15 (5): 662–79
7. Tufte: The Visual Display of Quantitative Information. 2001, Graphic Press
8. Wheelan, Charles. 2013. Naked Statistics: Stripping the Dread from the Data. W. W. Norton & Company.

**.**

**LIBRARY RESOURCES & INFORMATION LITERACY: MAJOR CURRICULUM MODIFICATION**

Consult with your library faculty subject specialist (<http://cityte.ch/dir>) **3 weeks before the proposal deadline**.

**Course proposer:** please complete boxes 1-4. **Library faculty subject specialist:** please complete box 5.

|  |  |  |
| --- | --- | --- |
| **1** | **Title of proposal**  Econ 3301 Visualizing and Mapping Economic Data | **Department/Program**  Social Science/Data Analytics-Economics |
|  | **Proposed by** (include email & phone)  Sean MacDonald smacdonald@citytech.cuny.edu | **Expected date course(s) will be offered**  Spring 2020  **# of students** 20 |

|  |  |
| --- | --- |
| **2** | **The library cannot purchase reserve textbooks for every course at the college, nor copies for all students. Consult our website (<http://cityte.ch/curriculum>) for articles and ebooks for your courses, or our open educational resources (OER) guide (<http://cityte.ch/oer>). Have you considered using a freely-available OER or an open textbook in this course?**  The resources/readings for the course are either open educational resources or are freely available to students. |

|  |  |
| --- | --- |
| **3** | **Beyond the required course materials, are City Tech library resources sufficient for course assignments? If additional resources are needed, please provide format details (e.g. ebook, journal, DVD, etc.), full citation (author, title, publisher, edition, date), price, and product link.**  Yes. The required readings can be accessed through the library website. The other resources, including mapping software, can be accessed online. |

|  |  |
| --- | --- |
| **4** | **Library faculty focus on strengthening students' information literacy skills in finding, critically evaluating, and ethically using information. We collaborate on developing assignments and customized instruction and research guides. When this course is offered, how do you plan to consult with the library faculty subject specialist for your area? Please elaborate.**  Students will be required to complete assigned readings and to complete a final project for the course. A workshop stressing the importance of complete source citation and acceptable ways to reference sources in writing would be quite helpful in heightening students’ awareness of plagiarism issues. |

|  |  |
| --- | --- |
| **5** | **Library Faculty Subject Specialist \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  **Comments and Recommendations**  **Date** |

**Chancellor’s Report Form**

|  |  |
| --- | --- |
| Department(s) | Social Science |
| Academic Level | [ X ] Regular [ ] Compensatory [ ] Developmental [ ] Remedial |
| Subject Area | Data Analytics/Economics |
| Course Prefix | ECON |
| Course Number | ECON 3301 |
| Course Title | Visualizing and Mapping Economic Data |
| Catalog Description | This course offers an introduction to presenting data visually in maps and charts, with a focus on data analysis in applied contexts including health, labor market, household, demographic, and environmental data. Topics include summarizing and analyzing visualized data and preparing story maps. |
| Prerequisite | ECON 2101 or ECON 2401 |
| Corequisite | None |
| Pre- or corequisite |  |
| Credits | 3 |
| Contact Hours | 3 class hours |
| Liberal Arts | [ X ] Yes [ ] No |
| Course Attribute (e.g. Writing Intensive, etc) |  |
| Course Applicability |  |
| [ X ] Major |  |

**Rationale:** This course contributes to the Social Science Department’s new major in Data Analytics/Economics. It focuses on the importance of effectively communicating both visually and in writing, the key trends and information that are revealed in various social, economic and demographic data. Effective written, verbal and visual communication are essential skills in data analytics, and this course focuses on providing students with some critical tools for strengthening such sills. These are also important goals of the curriculum for the proposed Data Analytics/Economics program.

## D.9 ECON 4201 Internship/Research Project

**Course Title:** Internship/Research Project (ECON 4201)

**Hours:** 120 hours total; Scheduling of hours can be determined in conjunction with the company/research arrangement in which the experience takes place. A summer internship could be based on 20 hours/week for 6 weeks.

**Credits:** 3 credits

**Prerequisites:** Departmental approval

**Required and Recommended Instructional Materials**

Specific instructional materials will be determined with the internship supervisor and/or faculty member mentoring the research project.

New York City College of Technology, CUNY

CURRICULUM MODIFICATION PROPOSAL FORM

This form is used for all curriculum modification proposals. See the [Proposal Classification Chart](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Proposal_Classification_Chart.pdf) for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.

|  |  |
| --- | --- |
| **Title of Proposal** | Internship/Research Project |
| **Date** | September 6, 2018 |
| **Major or Minor** | major |
| **Proposer’s Name** | Sean P MacDonald |
| **Department** | Social Science |
| **Date of Departmental Meeting in which proposal was approved** | Nov. 1, 2018 |
| **Department Chair Name** | Peter Parides |
| **Department Chair Signature and Date** | Chair approved this as part of overall proposal. |
| **Academic Dean Name** | Justin Vazquez-Poritz |
| **Academic Dean Signature and Date** | Picture 28 1/27/19 |
| **Brief Description of Proposal**  (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body. | This proposal details the requirements for the student internship/research project in the Data Analytics/Economics degree program. The internship would be completed during the fourth year of study in the program. |
| **Brief Rationale for Proposal**  (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body). | The internship provides valuable experience for students in an applied setting. This experience will allow students who are nearing completion of their course requirements for the degree to obtain the kind of knowledge that will be valuable in preparing them for employment upon graduation. In the case of the research project, the mentored semester research project will offer students who may be planning to continue with graduate study, the opportunity to engage in an in-depth exploration of a specific topic or problem, while helping to prepare them for the kind of independent self-directed study that may be expected in a graduate program. |
| **Proposal History**  (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list). | This is a new proposal |

Please include all appropriate documentation as indicated in the Curriculum Modification Checklist.

For each new course, please also complete the New Course Proposal and submit in this document.

Please submit this document as a single .doc or .rtf format. If some documents are unable to be converted to .doc, then please provide all documents archived into a single .zip file.

**ALL PROPOSAL CHECK LIST**

|  |  |
| --- | --- |
| Completed CURRICULUM MODIFICATION FORM including: |  |
| * Brief description of proposal | x |
| * Rationale for proposal | x |
| * Date of department meeting approving the modification | x |
| * Chair’s Signature | x |
| * Dean’s Signature | x |
| Evidence of consultation with affected departments  List of the programs that use this course as required or elective, and courses that use this as a prerequisite. | x |
| Documentation of Advisory Commission views (if applicable). | N/A |
| Completed [Chancellor’s Report Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-09-Chancellor_Report_Quick_Reference_Guide1.doc). | x |
| Documentation indicating core curriculum requirements have been met for new programs/options or program changes. | x |
| Detailed rationale for each modification (this includes minor modifications) | x |

New York City College of Technology, CUNY

NEW COURSE PROPOSAL FORM

This form is used for all new course proposals. Attach this to the [Curriculum Modification Proposal Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-10-Curriculum_Modification_Proposal_Form.docx) and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

|  |  |
| --- | --- |
| **Course Title** | Internship/Research Project |
| **Proposal Date** | September 5, 2018 |
| **Proposer’s Name** | Sean P. MacDonald |
| **Course Number** | ECON 4201 |
| **Course Credits, Hours** | 3 cr; 3 hours |
| **Course Pre / Co-Requisites** | Completion of 3 years toward degree; permission of dept. |
| **Catalog Course Description** | The internship/research project provides students with hands-on experience in an applied setting. Students will be able to apply the skills acquired in academic courses in a real professional environment. For students who wish to apply for graduate programs, the semester research project can substitute for the internship. This would be selected by the student and faculty mentor within the department. |
| **Brief Rationale**  Provide a concise summary of why this course is important to the department, school or college. | Following completion of most of the course credits toward the bachelor of science in Data Analytics/Economics, the internship experience provides the opportunity for students to apply the skills and knowledge they have obtained in their coursework. This real-world experience is valuable in preparing students to enter the job market upon completion of their degree. Similarly, students planning to pursue graduate studies, and who opt for the semester research project can gain valuable experience from self-guided intensive work on a research question. |
| **CUNY – Course Equivalencies**  Provide information about equivalent courses within CUNY, if any. | There are currently no similar models for internships/research projects in this particular four-year degree program in Data Analytics with an Applied Economics focus. |
| **Intent to Submit as Common Core**  If this course is intended to fulfill one of the requirements in the common core, then indicate which area. | N/A |
| **For Interdisciplinary Courses:**   * Date submitted to ID Committee for review * Date ID recommendation received   - Will all sections be offered as ID? Y/N | N/A |
|  |
|  |
| **Intent to Submit as a Writing Intensive Course** | Yes |

Please include all appropriate documentation as indicated in the NEW COURSE PROPOSAL Combine all information into a single document that is included in the Curriculum Modification Form.

**NEW COURSE PROPOSAL CHECK LIST**

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

|  |  |
| --- | --- |
| **Completed NEW COURSE PROPOSAL FORM** |  |
| * Title, Number, Credits, Hours, Catalog course description | x |
| * Brief Rationale | x |
| * CUNY – Course Equivalencies | x |
| Completed [Library Resources and Information Literacy Form](https://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/curriculum_modification_library_form-rev3F16.doc) | x |
| **Course Outline**  Include within the outline the following. |  |
| Hours and Credits for Lecture and Labs  If hours exceed mandated Carnegie Hours, then rationale for this | x |
| Prerequisites/Co- requisites | x |
| Detailed Course Description | x |
| Course Specific Learning Outcome and Assessment Tables   * Discipline Specific * General Education Specific Learning Outcome and Assessment Tables | x |
| Example Weekly Course outline | x |
| Grade Policy and Procedure | x |
| Recommended Instructional Materials (Textbooks, lab supplies, etc) | x |
| Library resources and bibliography | x |
| **Course Need Assessment.**  Describe the need for this course. Include in your statement the following information. |  |
| Target Students who will take this course. Which programs or departments, and how many anticipated?  Documentation of student views (if applicable, e.g. non-required elective). | x |
| Projected headcounts (fall/spring and day/evening) for each new or modified course. | x |
| If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction. | x |
| Where does this course overlap with other courses, both within and outside of the department? | x |
| Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this? | x |
| If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need. | x |
| **Course Design**  Describe how this course is designed. |  |
| Course Context (e.g. required, elective, capstone) | x |
| Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)? | x |
| Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture) | x |
| How does this course support Programmatic Learning Outcomes? | x |
| Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program. | x |
| **Additional Forms for Specific Course Categories** |  |
| [Interdisciplinary Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/Application-for-Interdisciplinary-Course-Designation.docx) (if applicable) | N/A |
| Interdisciplinary Committee Recommendation (if applicable and if received)\*  \*Recommendation must be received before consideration by full Curriculum Committee | N/A |
| [Common Core (Liberal Arts) Intent to Submit](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/CommonCoreCourseSubmissionForm_4.2.12.doc) (if applicable) | N/A |
| Writing Intensive Form if course is intended to be a WIC (under development) | x |
| If course originated as an experimental course, then results of evaluation plan as developed with director of assessment. | N/A |
| **(Additional materials for [Curricular Experiments](http://www.300jaystreet.com/college-council/curriculum_proposals/curricular-experiments))** |  |
| Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information). | N/A |
| Established Timeline for Curricular Experiment | N/A |

Proposed Course Name: Internship/Research Project

Course Overview & Rationale

The internship provides valuable experience for students in an applied setting. This experience will allow students who are nearing completion of their course requirements for the bachelor of science degree in Data Analytics/Economics to obtain the kind of training and knowledge that will be valuable in preparing them for the job market upon graduation. The internship experience further provides an opportunity for students to apply the specific skills and knowledge they have acquired through their coursework to a real-world setting.

In the case of the research project, the mentored semester research project will offer students who may be planning to continue with graduate study, the opportunity to engage in an in-depth exploration of a specific topic or problem, while helping to prepare them for the kind of independent self-directed study that may be expected in a graduate program.

**Course Need**: Students who would take this class: students who are nearing completion of their coursework in the Data Analytics/Economics degree program

**Department:** Social Science

**Program**: Bachelors of Science in Data Analytics/Economics

**The number of section (s) anticipated**: one section for the first year

**Projected headcount**: 10 students

**Physical Resources required**: N/A

**Course overlap**: None

**Faculty qualified for teaching this course**: Yes, there are faculty members who are qualified to teach this course.

**Course design**

**Course context**: This course will be required of students in the Data Analytics/Economics major. Students are required to complete a semester or summer internship or to complete a semester research project for this course.

**Course structure**: Mentoring and supervision of internship experience or self-directed research

**Anticipated Pedagogical Strategies and Instructional Design**: Faculty mentoring students in the semester research project will meet regularly with the student and provide specific feedback and direction as the student works through the steps of the project.

**Providing Support to Programmatic Learning Outcomes**: The course requires successful completion of an internship in the student’s field of specialization or completion of a research project.

NEW YORK CITY COLLEGE OF TECHNOLOGY

The City University of New York

Department of Social Science

Environmental Economics

ECON 4201 (3 Class Hours, 3 Credits)

Internship/Research Project

ECON 4201: Internship/Research Project

**CATALOG DESCRIPTION**: The internship/research project provides students with hands-on experience in an applied setting. Students will be able to apply the skills acquired in academic courses in a real professional environment. For students who wish to apply for graduate programs, the semester research project can substitute for the internship. This would be selected by the student and faculty mentor within the department.

**Course Format**

The student and faculty mentor will develop an internship plan/research project, and the student is responsible for drafting a detailed plan/proposal (3-4 pages) to be submitted to the faculty mentor no later than the end of the second week of class. Upon departmental approval, the student will receive feedback on the Internship plan/Research proposal, which will then be finalized by the end of week 3. The final proposal will count as the first assignment in the course. During weeks 3 - 15, the student will keep a weekly journal with a progress report. Students will be required to submit a final report on the internship project -or research paper- (minimum 5 pages), and to give an oral presentation on the internship experience or research project

**Course Learning Outcomes and Methods of Assessment**

Upon successful completion of the course, students will be able to address the following:

|  |  |
| --- | --- |
| Learning Outcomes | Assessment Methods |
| 1. Evaluate the literature and use the applied tools acquired in coursework in the internship or research project | 1. Successful application of the theoretical and applied tools to the internship or research project; final oral presentation; final written report/research paper |
| 2. Effectively communicate economic concepts and methods of analysis | 2. Demonstration of strong written and oral communication skills |
| 3. Demonstrate how the skills gained in the coursework have been applied to the particular internship experience or research project | 3. Evaluation of Internship or Research project proposal; applied analytical tools; Supervision evaluation at the end of the internship |
| 4. Demonstrate the ethical application of applied methods and tools; clearly explain the significance of the internship experience/research project | 4. Evaluation of Internship experience (faculty and internship supervisor); evaluation of final research proposal, presentation and paper |
| Other internship/research instructional outcomes may be developed by student and supervisor/faculty mentor. | |

**General Education Learning Outcomes and Methods of Assessment**

|  |  |
| --- | --- |
| LEARNING OUTCOMES | ASSESSMENT METHODS |
| 1. KNOWLEDGE: To develop an understanding of how to effectively apply the key concepts and methodologies of data analytics using economic data. | 1. Regular meetings with student to provide feedback and suggestions on the research project/regular follow up with student and internship supervisor. |
| 2. SKILLS: Develop and apply the tools of economic analysis to critically question, analyze, and summarize economic data; Develop and strengthen the ability to discuss concepts and thoughts in writing. | 2. Journal; research/internship proposal; midterm report |
| 3. INTEGRATION: Apply the tools and analytical approaches acquired in coursework to an understanding of a specific research question or work experience. | 3. A final research project that requires students to select and define a topic, problem or issue; searching and examining relevant data and conveying key information about its meaning and implications; Final in-class presentation and research report |
| 4. VALUES, ETHICS, AND RELATIONSHIPS: Develop an understanding of and ability to apply diverse perspectives to the analysis of economic data; work creatively with others in problem solving; develop a respect for diverse viewpoints and apply these to the analysis of related topics | 4. Final presentation and research summary/report reflecting on internship experience. |

**Course Title:** Internship/Research Project (ECON 4201)

**Hours:** 120 hours total; Scheduling of hours can be determined in conjunction with the company/research arrangement in which the experience takes place. A summer internship could be based on 20 hours/week for 6 weeks.

**Credits:** 3 credits

**Prerequisites:** Completion of 90 course credits toward Data Analytics degree; departmental approval

**Required and Recommended Instructional Materials**

Specific instructional materials will be determined with the internship supervisor and/or faculty member mentoring the research project.

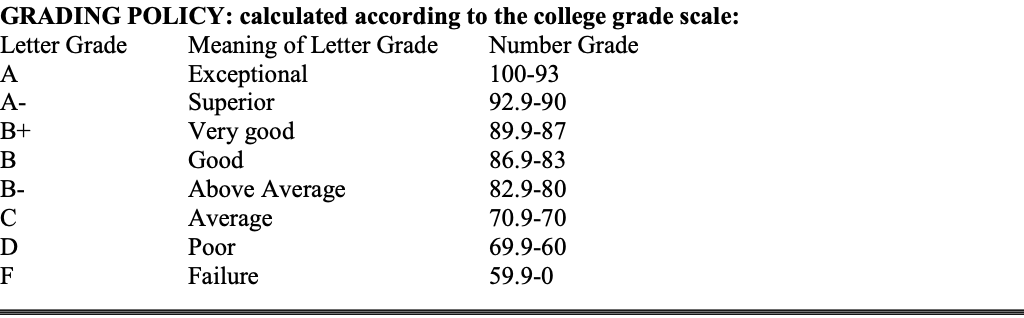
Upon successful completion of the internship, students should be able to:

**Scope of assignments**

Students in this course will complete a log and an oral presentation on the internship experience; student performance in the internship will be evaluated by the internship supervisor.

**METHOD OF GRADING**: elements and weight of factors determining course grade)

|  |  |
| --- | --- |
| 1. Oral presentation | 25% |
| 2. Written documents | 25% |
| 3. Supervisor/mentor evaluation (including journal) | 25% |
| 4. Level of difficulty | 25% |



**ACADEMIC INTEGRITY**

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

**Course Outline**

Requirements:

1. Before registering for ECON 4201 students should have a Career Objectives form signed by an advisor.
2. After registering for the internship, students should complete a Contact Information Form.
3. During the internship students should:

1. Keep a Log of dates, hours and daily activities.

2. Meet regularly with the internship coordinator.

IV. To receive credit, students must work 120 hours in the host organization under direct and regular supervision of the internship coordinator. At the end of the internship, students must provide:

1. A completed Self-Evaluation Form.

2. An Evaluation Form from the employer or supervisor.

3. A Log.

4. Written Report. This should include a paragraph on the company or organization where the student completed his/hers internship.

5. An oral presentation summarizing the internship experience.

6. An updated resume. Students will be required to attend a workshop on writing a resume offered by the placement office.

7. An Internship Reflection Form.

1. The grade will be calculated as follows: 25% oral presentation, 25% written documents, 25% supervisor evaluation, and 25% level of difficulty.

**LIBRARY RESOURCES & INFORMATION LITERACY: MAJOR CURRICULUM MODIFICATION**

Consult with your library faculty subject specialist (<http://cityte.ch/dir>) **3 weeks before the proposal deadline**.

**Course proposer:** please complete boxes 1-4. **Library faculty subject specialist:** please complete box 5.

|  |  |  |
| --- | --- | --- |
| **1** | **Title of proposal**  Bachelor of Science in Data Analytics/Economics | **Department/Program**  Social Science/Data Analytics-Economics |
|  | **Proposed by** (include email & phone)  Sean MacDonald [smacdonald@citytech.cuny.edu](mailto:smacdonald@citytech.cuny.edu) | **Expected date course(s) will be offered**  Spring 2020  **# of students** 10 |
| **2** | **The library cannot purchase reserve textbooks for every course at the college, nor copies for all students. Consult our website (<http://cityte.ch/curriculum>) for articles and ebooks for your courses, or our open educational resources (OER) guide (<http://cityte.ch/oer>). Have you considered using a freely-available OER or an open textbook in this course?**  The library should have many resources that would support the research undertaken by students completing the research project. | |
| **3** | **Beyond the required course materials, are City Tech library resources sufficient for course assignments? If additional resources are needed, please provide format details (e.g. ebook, journal, DVD, etc.), full citation (author, title, publisher, edition, date), price, and product link.**  List recommended texts/materials here | |
| **4** | **Library faculty focus on strengthening students' information literacy skills in finding, critically evaluating, and ethically using information. We collaborate on developing assignments and customized instruction and research guides. When this course is offered, how do you plan to consult with the library faculty subject specialist for your area? Please elaborate.**    Information literacy is extremely important. We would welcome consultation with a library faculty specialist who might offer recommendations and additional resources for the internship/research project. | |
| **5** | **Library Faculty Subject Specialist \_\_Keith Muchowski**  **Comments and Recommendations**  **Date** | |

**Chancellor’s Report Form**

|  |  |
| --- | --- |
| **Department(s)** | Social Science |
| **Academic Level** | **[ X ] Regular  [   ] Compensatory  [   ] Developmental  [   ] Remedial** |
| **Subject Area** | Data Analytics/Economics |
| **Course Prefix** | ECON |
| **Course Number** | ECON 4201 |
| **Course Title** | Internship/Research Project |
| **Catalog Description** | The internship/research project provides students with hands-on experience in an applied setting. Students will be able to apply the skills acquired in academic courses in a real professional environment. For students who wish to apply for graduate programs, the semester research project can substitute for the internship. This would be selected by the student and faculty mentor within the department. |
| **Prerequisite** | ECON 1101; ECON 1401 |
| **Corequisite** | None |
| **Pre- or corequisite** | Completion of 90 credits (three years) toward degree |
| **Credits** | 3 |
| **Contact Hours** | 3 class hours |
| **Liberal Arts** | **[ X ] Yes  [   ] No** |
| **Course Attribute (e.g. Writing Intensive, etc)** | Writing Intensive |
| **Course Applicability** | **[ X ] Major**  **[ ] Gen Ed Required [ ] Gen Ed - Flexible [ ] Gen Ed - College Option**  **[ ] English Composition [ ] World Cultures [ ] Speech**  **[ ] Mathematics [ ] US Experience in its Diversity [ ] Interdisciplinary**  **[ ] Science [ ] Creative Expression [ ] Advanced Liberal Arts**  **[ ] Individual and Society**  **[ ] Scientific World** |
| **Effective Term** | Spring 2020 |

**Rationale:** Following completion of most of the course credits toward the bachelor of science in Data Analytics/Economics, the internship experience provides the opportunity for students to apply the skills and knowledge they have obtained in their coursework. This real-world experience is valuable in preparing students to enter the job market upon completion of their degree. Similarly, students planning to pursue graduate studies, and who opt for the semester research project can gain valuable experience from self-guided intensive work on a research question.

# Appendix E – Program Admission Requirements

The Data Analytics/Economics baccalaureate program is designed to provide an applied focus in the analysis of economic data. The program is designed to address the rapidly growing demand for new graduates with applied data analytics training. Core courses in applied economics provide a strong foundation that will prepare students for positions within a number of industries and occupations, including health, finance, public policy, real estate, environmental analysis, digital media, research and development, industrial organization, behavioral economics, and corporate finance. At the same time, the skills attained through City Tech’s General Education courses will prepare students to think critically, apply the tools of economic and data analysis and to work across disciplinary perspectives.

The applied intermediate level courses in two main branches of economics covering topics in various subdisciplines such as health, environmental, behavioral, managerial economics, international trade and finance, and industrial organization will provide a grounding in the applied focus. These courses will provide students with the skills needed to think critically and to understand and clearly communicate increasingly more complex and advanced economic concepts and theory based on applications to real-world economic problems. At the same time, the required sequence of courses in mathematics including calculus I, II and III, statistics with probability, will enable students to develop and sharpen their skills in quantitative analysis, providing the foundation for more complex problem-solving skills needed for more advanced economic analysis and econometrics courses. Finally, the Data Analytics degree program would require students to participate in a semester long internship or research project.

Admissions Criteria

Students applying for admission to the program must meet the college standards for admission into a baccalaureate program. Students who do not have the mathematics background required to enroll in MAT 1375 (Calculus I) but who meet other admission requirements can use the program elective credits to complete the pre-requisite courses.

Students transferring to the Data Analytics/Economics program must have:

* A minimum cumulative GPA of 2.5 or higher
* At least one semester of college-level English composition
* Be eligible to enroll in MAT 1375 or higher (or have completed MAT 1275 or the equivalent with a grade of C or higher)
* Exceptions can be made with the permission of the department chairperson.

Transfer students lacking any of these criteria must seek the approval of the Department Chair or Program Coordinator. College coursework in economics is strongly recommended for applicants but is not required for admission. In addition, transfer students must have a minimum GPA of 2.5.

Progression and Graduation Requirements

* Students must maintain a cumulative GPA of 2.5
* Students must achieve a C or higher, in all required courses in the major\*
* Students can only repeat a required course once\*\* (do we want to add this requirement)?

The program’s curriculum is designed for students to achieve the following learning outcomes:

* The ability to apply statistical methods and to use programming skills to analyze complex economic data and economic/social problems.
* To develop of a firm understanding of complex sample non-survey and survey data and expertise in working with large scale datasets.
* To acquire a strong computational foundation (computer knowledge) for technical skills, including data mining – downloading and analyzing large datasets.
* To recognize and understand the importance of identifying and ethically applying acceptable research.
* To develop, strengthen and apply critical thinking skills to economic analysis.
* The ability to clearly and effectively communicate ideas orally and in writing.
* To develop and effectively apply mathematical and problem-solving skills in the analysis of economic data.

# Appendix F -- A List of Data Analytics and Data Science Programs

1. **Sample Bachelor of Science in Data Science Programs**

* NYU School of Professional Studies
  + <http://www.sps.nyu.edu/academics/departments/mcghee/undergraduate/bachelors/bs-applied-data-analytics-and-visualization.html>
* Columbia University
  + <https://mice.cs.columbia.edu/c/d.php?d=245>
* Penn State University
  + <https://datasciences.psu.edu/>
* Drexel University
  + <http://catalog.drexel.edu/undergraduate/collegeofcomputingandinformatics/datascience/>
* George Mason University
  + <https://cos.gmu.edu/cds/bs-in-computational-and-data-sciences/>
* Purdue University
  + <http://catalog.purdue.edu/preview_program.php?catoid=8&poid=10127>
* University of Massachusetts - Dartmouth
  + <http://www.umassd.edu/programs/data-science/>
* University of Michigan
  + <https://www.eecs.umich.edu/eecs/undergraduate/data-science/>
* University of Rochester
  + <http://www.sas.rochester.edu/dsc/undergraduate/major.html>
* University of San Francisco, College of Arts and Science <https://www.usfca.edu/arts-sciences/undergraduate-programs/data-science>
* University of California Irvine (UCI)
  + <http://datascience.uci.edu/data-science-degree/>
* University of Wisconsin River Falls <https://www.uwrf.edu/Academics/Undergraduate/Data-Science-Degree.cfm>
* Luther College
  + <http://www.luther.edu/computer-science/data-science-major/>
* Valparaiso University
  + <https://www.valpo.edu/mathematics-statistics/academics/degree-programs/b-s-in-data-science/>
* Becker College
  + <https://www.becker.edu/academics/undergrad/school-of-design-technology/data-science>
* Smith College
  + <https://www.smith.edu/sds/major.php>
* Winona State University
  + <https://www.winona.edu/math-stat/data-science.asp>
* University of Nebraska
  + <https://www.unomaha.edu/college-of-arts-and-sciences/mathematics/_files/datascience.pdf>
* College of Charleston
  + <http://datascience.cofc.edu/program-information/index.php>
* Marist College
  + <http://www.marist.edu/compscimath/undergraduate/data-science-and-analytics.html>

**2. Sample Masters of Science in Data Science Programs**

* CUNY - Graduate Center
  + <https://www.gc.cuny.edu/Page-Elements/Academics-Research-Centers-Initiatives/Masters-Programs/Data-Science>
* Columbia University
  + <http://datascience.columbia.edu/master-of-science-in-data-science>
* New York University
  + <https://cds.nyu.edu/academics/ms-in-data-science/>
* University of Rochester
  + <http://www.sas.rochester.edu/dsc/graduate/ms.html>
* Cornell
  + <http://stat.cornell.edu/academics/mps>
* Fordham University
  + <https://www.fordham.edu/info/25661/master_of_science_in_data_analytics/9052/courses_and_degree_requirements>
* Rutgers
  + <https://mbs.rutgers.edu/program/analytics-discovery-informatics-data-sciences>
* Stanford
  + <https://statistics.stanford.edu/academics/ms-statistics-data-science>
* University of California - San Diego
  + <http://jacobsschool.ucsd.edu/mas/dse/>
* University of Illinois at Urbana-Champaign
  + <https://online.illinois.edu/mcs-ds>
* University of San Francisco, College of Arts and Science
  + <https://www.usfca.edu/arts-sciences/graduate-programs/data-science>
* University of Southern California
  + <https://viterbigradadmission.usc.edu/programs/masters/msprograms/computer-science/ms-cs-data-science/>
* UMass Amherst
  + <https://www.cics.umass.edu/grads/data-science-concentration-elective-requirements>

1. Baruch College, Zicklin School of Business <http://zicklin.baruch.cuny.edu/programs/undergrad/degrees/computer-information-systems/computer-information-system/copy_of_computer-information-systems> [↑](#footnote-ref-1)
2. Louis Columbus. “Where Big Data Jobs will be in 2016.” *Forbes/Tech*, Nov. 16, 2015. <https://www.forbes.com/sites/louiscolumbus/2015/11/16/where-big-data-jobs-will-be-in-2016/#57590406608c> [↑](#footnote-ref-2)
3. Ibid. [↑](#footnote-ref-3)
4. Sarah Royster, “Working With Big Data.” U.S. Bureau of Labor Statistics, Fall 2013. <http://www.bls.gov/ooq> [↑](#footnote-ref-4)
5. U.S. Bureau of Labor Statistics. “Occupational Employment and Wages, 2016.” <https://www.bls.gov/news.release/pdf/ocwage.pdf> [↑](#footnote-ref-5)
6. New York State Department of Labor. New York State Short-term Occupational Employment Projections, 2016-2018. <https://www.labor.ny.gov/stats/lsproj.shtm> [↑](#footnote-ref-6)
7. New York State Department of Labor. Short-term Projected Regional Occupational Projections, 2013-2015. <https://www.labor.ny.gov/stats/lsproj.shtm> [↑](#footnote-ref-7)
8. U.S. Bureau of Labor Statistics, “Working with Big Data,” *Occupational Outlook Quarterly*, Fall 2013, [www.bls.gov/ooq](http://www.bls.gov/ooq) [↑](#footnote-ref-8)
9. See http://www.bigdatasocialscience.com/ [↑](#footnote-ref-9)
10. Please refer to the reference at the end for details and links. [↑](#footnote-ref-10)
11. The CIVIS Analytics “work on projects like predicting national-level consumer behavior, creating novel visualizations for interactive clustering of survey respondents, large-scale constrained resource allocations, and building generalizable predictive analytics software. … [Their] applied data scientists then use this work for diverse projects ranging from finding America’s uninsured citizens to optimizing millions of dollars of media spending” (CIVIS Analytics website). [↑](#footnote-ref-11)
12. http://www.mastersindatascience.org/careers/data-analyst/ [↑](#footnote-ref-12)
13. http://www.payscale.com/research/US/Job=Data\_Analyst/Salary [↑](#footnote-ref-13)
14. Based on the rate of 77.3 percent for first-year students in bachelor’s degree programs in the fall 2015 cohort as reported in the 2018 Middle States Self-Study Report. [↑](#footnote-ref-14)