

Course Outline

| 1. COURSE INFORMATION | | | |
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| Session Offered | Fall 2017 | | |
| Course Name | Quality Control and Assurance Methods | | |
| Course Code | GENTECH 3LS3 | | |
| Date(s) and Time(s) of lectures | C01: Tuesday 11:30am-1:30pm C02: Friday 1:30-3:30 pm C03: Thursday 10:30am-12:30 pm | T01: Tuesday 2:30-3:30 pm T02: Tuesday 3:30-4:30 pm T03: Friday 9:30-10:30 am T04: Friday 10:30-11:30 am T05: Monday 2:30-3:30pm | |
| Program Name | One of the following: Automotive & Vehicle Engineering Technology / Biotechnology / Automation Engineering Technology | | |
| Calendar Description | Statistical tools, tests, design and analysis of planned experiments, Taguchi methods, control charts for variables and attributes, capability analysis, acceptance sampling, elements of reliability, quality assurance, ISO 9000 certification. | | |
| Instructor(s) | Karen Lawrence, MSc | Email: lawrek@mcmaster.ca Office: ETB/204 Office Hours: By advance appointment only | |
| 2. COURSE SPECIFIC | | | |
| Course Objectives | The course focuses on planning, measurement, control, and improvement of quality using statistical tools, tests and methods such as Design Of Experiments (DOE), Taguchi methods, control charts, capability, measurement systems analysis, and acceptance sampling. Quality Management strategies (i.e. Six Sigma) and ISO standards are introduced. Course assessment will include software laboratory tutorials, a project, a midterm and a comprehensive final examination. | | |
| Instruction Type | Code | Type | Hours per term |
| | C | Classroom instruction | 26 |
| | L | Laboratory, workshop or fieldwork | 13 |
| | T | Tutorial | |
| | DE | Distance education | |
| | Total Hours | | 39 |
| Resources | ISBN | Textbook Title & Edition | Author & Publisher |
| | 9781118146811 | Introduction to Statistical Quality Control, 7 th Ed | Douglas C. Montgomery, John Wiley & Sons, Inc. |
| | 9781118324165 | (E-text) | Douglas C. Montgomery, John Wiley & Sons, Inc. |
| | Other Supplies | | Source |
| | <ul style="list-style-type: none"> • Minitab® Statistical Software • Quality Trainer® • Scientific calculator w/ stat functions (Casio) | | Download (Avenue) Registration (Avenue) Bookstore |

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| Prerequisite(s) | ENG TECH 2ES3 or 3ES3 and registration in Level III or above of Automotive and Vehicle Technology, Biotechnology or Process Automation Technology |
| Co-requisite(s) | N/A |
| Anti-requisite(s) | GEN TECH 3TO3 and 4SS3 |
| Course Specific Policies | <p>This course will be using a range of software. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.</p> <p>It is expected that students read the material that is coming under discussion prior to class. Students are expected to actively participate during class sessions offering insight, comment, reinforcement, argument, contrary views and underscoring examples.</p> <p>No late assignments/tutorials are accepted. One assignment/tutorial mark will be dropped from the semester. NOTE: If an MSAF was submitted for an assignment/tutorial, the associated assignment/tutorial becomes the dropped mark.</p> <p>Late projects will be assigned a deduction of 10% per day up to three days from the due date. After three days from the due date, projects will not be accepted.</p> <p>Please note that there <u>are no make-up or deferred midterm examinations</u> in this course. If, for any reason, a student misses a midterm examination, the value of that examination will be applied to the cumulative final examination (i.e. a missed midterm exam will result in the cumulative final examination being weighted at 70% of the final grade).</p> <p><u>MSAF is not permissible for weights on evaluations (i.e. midterm, final exam) that are greater than or equal to 25%.</u> Any attempt to submit a falsified MSAF for this course for a missed midterm exam constitutes academic dishonesty and charges may be filed with the Office of Academic Integrity.</p> <p>Final exam is cumulative.</p> <p>Students must achieve a cumulative passing mark (50%) on the midterm and final to pass the course.</p> |
| Departmental Policies | <p>Students must maintain a GPA of 3.5/12 to continue in the program.</p> <p>In order to achieve the required learning objectives, on average, B.Tech. students can expect to do at least 3 hours of “out-of-class” work for every scheduled hour in class. “Out-of-class” work includes reading, research, assignments and preparation for tests and examinations.</p> <p>Where group work is indicated in the course outline, such collaborative work is mandatory.</p> <p>The use of cell phones, iPods, laptops and other personal electronic devices are prohibited from the classroom during the class time, unless the instructor</p> |

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| | <p>makes an explicit exception.</p> <p>Announcements made in class or placed on Avenue are considered to have been communicated to all students including those individuals that are not in class.</p> <p>Instructor has the right to submit work to software to identify plagiarism.</p> | |
| 3. SUB TOPIC(S) | | |
| Week 1 | <p>Review of Statistical Methods for Quality</p> <ul style="list-style-type: none"> • Construct and interpret visual displays of data • Calculate and interpret statistical measures • Select appropriate probability models • Construct and interpret confidence intervals • Develop and test hypotheses • Interpret statistical measures from inferential methods (t-tests, ANOVA) • Fit and interpret linear models • Use Minitab for statistical methods | Chapter 3-4 |
| Week 2 | <p>Management strategies, Quality systems and standards (ISO), DMAIC process (Six Sigma)</p> | <i>Tutorial 1 due</i> Chapter 1-2 |
| Week 3 | <p>Design Of Experiments (D.O.E.) Introduction</p> <ul style="list-style-type: none"> • Determine the role and objectives of designed experiments(DOE) in continuous improvement • Propose robustness and describe its significance in experimentation. • Outline the steps involved in setting up an experiment. • Plan, perform, analyze and provide conclusions for an experiment <p>Factorial Experiments</p> <ul style="list-style-type: none"> • Simulate a two level factorial experiment in standard order. • Calculate main and interaction effects. • Calculate estimates for standard error for effects using replications. | <i>Tutorial 2 due</i> Chapter 13 |
| Week 4 | <p>Fractional Factorial Experiments</p> <ul style="list-style-type: none"> • Explain the benefits and limitations of fractional factorial designs. • Recognize a fractional experiment in standard order accounting for confounding fold-over designs. • Explain the impact of saturated designs and the significant confounding effects. • Use Minitab to design and analyze fractional factorial designs | <i>Tutorial 3 due</i> Chapter 13 |
| Week 5 | <p>Model diagnostics and analysis procedures</p> <ul style="list-style-type: none"> • Use normal probability plots to select significant effects. • Produce an ANOVA table using effects (SS) and determine significant factors. • Derive the model equation and determine best outcomes. • Assess model adequacy using residuals | <i>Tutorial 4 due</i> Chapter 13 |

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| | <ul style="list-style-type: none"> Blocking and confounding Use Minitab to design and analyze factorial designs. | |
| <i>Mid-term recess (Monday, October 9 to Saturday, October 15, 2017)</i> | | |
| Week 7 | MIDTERM 30% (Date, Time & Location TBA) <i>A lecture (2h) for each core will be cancelled. (TBA).</i> | <i>DOE Project Proposal Due</i> |
| Week 8 | Methods and Philosophy of SPC <ul style="list-style-type: none"> Differentiate between common cause and special cause variation. Discuss the statistical basis of a control chart Rational subgroups Analyze patterns in control charts Integrate the seven tools of quality Create an implementation plan for SPC | Chapter 5 |
| Week 9 | Controls Charts for Variables & Process Capability <ul style="list-style-type: none"> Design, produce and interpret control charts for variables Calculate process capability ratios and assess against specifications Use Minitab to design and construct control charts and analyze process capability | Chapter 6 <i>DOE Project Report due</i> |
| Week 10 | Control Charts for Attributes <ul style="list-style-type: none"> Design, produce and interpret control charts for attributes Use Minitab to design and construct control charts | <i>Tutorial 5 due</i> Chapter 7 |
| Week 11 | Process and Measurement System Capability <ul style="list-style-type: none"> Estimate and interpret capability indices Conduct a measurement system analysis (MSA). Measure gauge capability (Gauge R & R) Use Minitab for capability and MSA | <i>Tutorial 6 due</i> Chapter 8 |
| Week 12 | Process Optimization and robust procedures <ul style="list-style-type: none"> Integrate Taguchi techniques of experimentation for improving engineering designs. Acceptance Sampling | <i>Tutorial 7 due</i> Chapter 14 Chapter 15-16 |
| Week 13 | Review | <i>Gauge R&R reports due</i> |
| Classes end – Wednesday, December 6, 2017 Final examination period: Friday, December 8 to Thursday, December 21, 2017 All examinations MUST BE written during the scheduled examination period | | |
| <p>Note: This structure represents a plan and is subject to adjustment term by term. The instructor and the university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes.</p> | | |
| 4. ASSESSMENT OF LEARNING | | Weight |
| Tutorials/Assignments {weekly} | | 15% |
| Projects | | 25% |
| <i>DOE (proposal 3%, report 12%) {week 9}</i> | | |
| <i>Gauge R&R (report 10%) {week 12}</i> | | |
| Midterm Examination {week 7} | | 25% |
| Final Examination | | 35% |

| TOTAL | 100% |
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| Percentage grades will be converted to letter grades and grade points per the University calendar. | |
| 5. LEARNING OUTCOMES | |
| 1. Demonstrate an understanding of Quality Management Strategies and ISO 9000 standards and their complementary function in operations. | |
| 2. Select appropriate statistical process control tools to determine if a process is running within acceptable industrial standards with the aid of statistical software. | |
| 3. Integrate statistical process control techniques within a framework of quality improvement. | |
| 4. Design statistical experiments and verify the benefits and limitations of different types of designs (including Taguchi techniques) with the aid of statistical software. | |
| 5. Measure gage capability and determine the components of variation in a measurement process. | |
| 6. Plan, design, perform, analyze and report on a statistically designed experiment with the aid of statistical software. | |
| 6. POLICIES | |
| Anti-Discrimination | |
| <p>The Faculty of Engineering is concerned with ensuring an environment that is free of all discrimination. If there is a problem, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.</p> <p>http://www.mcmaster.ca/policy/General/HR/Discrimination_Harassment_Sexual_Harassment-Prevention&Response.pdf</p> | |
| Academic Integrity | |
| <p>You are required to exhibit honestly and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.</p> <p>Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.</p> <p>It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, located at: http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicIntegrity.pdf.</p> <p>The following illustrates only three forms of academic dishonesty:</p> <ol style="list-style-type: none"> 1. Plagiarism. E.g. the submission of work that is not own or for which other credit has been obtained 2. Improper collaboration in group work 3. Copying or using unauthorized aids in tests and examinations. | |
| Requests for Relief for Missed Academic Term Work (Assignments, Mid-Terms, etc.) | |
| <p>The McMaster Student Absence Form is an on-line self-reporting tool for Undergraduate Students to report absences for:</p> <ol style="list-style-type: none"> 1) Relief for missed academic work worth less than 25% of the final grade resulting from medical or personal situations lasting up to three calendar days: <ul style="list-style-type: none"> • Students may submit a maximum of one academic work missed request per term. It is the responsibility of the student to follow up with instructors immediately (within the 3 day period that is specified in the MSAF) regarding the nature of the accommodation. All work due in that time period however can be covered by one MSAF. • MSAF cannot be used to meet religious obligation or celebration of an important religious holiday, for that has already been completed or attempted or to apply for relief for any final examination or its equivalent. 2) For medical or personal situations lasting more than three calendar days, and/or for missed academic work worth 25% or more of the final grade, and/or for any request for relief in a term | |

where the MSAF has not been used previously in that term:

Students must visit their Associate Dean's Office (Faculty Office) and provide supporting documentation.

E-Learning Policy

Consistent with the Bachelor of Technology's policy to utilize e-learning as a complement to traditional classroom instruction, students are expected to obtain appropriate passwords and accounts to access Avenue To Learn for this course. Materials will be posted by class for student download. It is expected that students will avail themselves of these materials prior to class. Students should be aware that, when they access the electronic components of this course, private information such as first and last names, user names for the McMaster e-mail account, and program affiliation may become apparent to all other students in the course. The available information is dependent on the technology used. Continuation in this course will be deemed consent to this disclosure. If you have any questions or concerns about this disclosure please discuss this with the course instructor. Avenue can be accessed via <http://avenue.mcmaster.ca>.

Communications

It is the student's responsibility to:

- Maintain current contact information with the University, including address, phone numbers, and emergency contact information.
- Use the University provided e-mail address or maintain a valid forwarding e-mail address.
- Regularly check the official University communications channels. Official University communications are considered received if sent by postal mail, by fax, or by e-mail to the student's designated primary e-mail account via their @mcmaster.ca alias.
- Accept that forwarded e-mails may be lost and that e-mail is considered received if sent via the student's @mcmaster.ca alias.
- Check the McMaster/Avenue email and course websites on a regular basis during the term.

Turnitin

This course will be using a web-based service (Turnitin.com) to reveal plagiarism. Students submit their assignment/work electronically to Turnitin.com where it is checked against the internet, published works and Turnitin's database for similar or identical work. If Turnitin finds similar or identical work that has not been properly cited, a report is sent to the instructor showing the student's work and the original source. The instructor reviews what Turnitin has found and then determines if he/she thinks there is a problem with the work. Students who do not wish to submit their work to Turnitin.com must still submit a copy to the instructor. No penalty will be assigned to a student who does not submit work to Turnitin.com. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, etc.). To see the Turnitin.com Policy, please go to <http://www.mcmaster.ca/academicintegrity/turnitin/students/>

Protection of Privacy Act (FIPPA)

The Freedom of Privacy of Information and Protection of Privacy Act (FIPPA) applies to universities. Instructors should take care to protect student names, student numbers, grades and all other personal information at all times. For example, the submission and return of assignments and posting of grades must be done in a manner that ensures confidentiality.

<http://www.mcmaster.ca/univsec/fippa/fippa.cfm>

Academic Accommodation of Students with Disabilities Policy

Students who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Academic accommodations must be arranged for each term of study. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail sas@mcmaster.ca. For further information consult McMaster's policy for Academic Accommodation of Students with Disabilities

<http://www.mcmaster.ca/policy/Students-AcademicStudies/AcademicAccommodation-StudentsWithDisabilities.pdf>

Students must forward a copy of the SAS accommodation to the instructor of each course and to the

Program Administrator of the B.Tech. Program immediately upon receipt. If a student with a disability chooses NOT to take advantage of a SAS accommodation and chooses to sit for a regular exam, a petition for relief may not be filed after the examination is complete. <http://sas.mcmaster.ca>

Student Code of Conduct

The Student Code of Conduct (SCC) exists to promote the safety and security of all the students in the McMaster community and to encourage respect for others, their property and the laws of the land. McMaster University is a community which values mutual respect for the rights, responsibilities, dignity and well-being of others. The purpose of the Student Code of Conduct is to outline accepted standards of behavior that are harmonious with the goals and the well-being of the University community, and to define the procedures to be followed when students fail to meet the accepted standards of behavior. All students have the responsibility to familiarize themselves with the University regulations and the conduct expected of them while studying at McMaster University.

<http://judicialaffairs.mcmaster.ca/pdf/SCC.pdf> and <http://www.mcmaster.ca/policy/Students-AcademicStudies/StudentCode.pdf>