

COURSE INFORMATION

Course Name:	Steel Structures	Course Code:	CIV ENG 4N04
Session Offered:	Fall 2021		
Calendar Description:	Introduction to design in steel, tension and compression members, plate buckling aspects, beam instability, beam design, beam-columns, bolted and welded connections. Applications employing steel structures and building code.		
Pre-Requisites:	Structural Analysis (3G04), Civil Engineering Materials & Design (3P04)		
Instructor:	Dr. Lydell Wiebe (wiebel@mcmaster.ca , JHE 333, 905-525-9140 x24620)		
Teaching Assistants:	Amir Banihashemi (baniham@mcmaster.ca) Anirban Kundu (kundua6@mcmaster.ca) Hamid Madani (moafimas@mcmaster.ca)		
Course Zoom Link:	https://mcmaster.zoom.us/j/96249755866?pwd=RmNqQ1lY-WVpWZlloc3ZsYzdxdlY4Zz09 (must be logged into Zoom with a McMaster account)		
Lectures:	Tuesday, Thursdays, and Fridays 11:30-12:20 pm, MDCL 1105 or Course Zoom Link		
Tutorials:	Fridays 3:30-5:20 pm, BSB 104 (first seats for registered in-class students) or Course Zoom Link		

Statement on Hybrid Teaching: I am excited by the possibility of working with many of you in person this Fall! I also understand that not all students will be able to participate in person, and I want to facilitate the best possible learning experience for everyone, whether in person or online. As of September 2, my plan is for in-person lectures to include frequent interactive activities while simultaneously engaging with students online using the Course Zoom Link, and to post recordings to the course website as quickly as possible. This plan may change based on guidance from Public Health and the University, as well as feedback from students. I hope that you will engage fully in the class, regardless of how you experience it, that you will be understanding of the trade-offs involved in meeting the diverse needs of students, and that you will be both honest and patient as we navigate this term together.

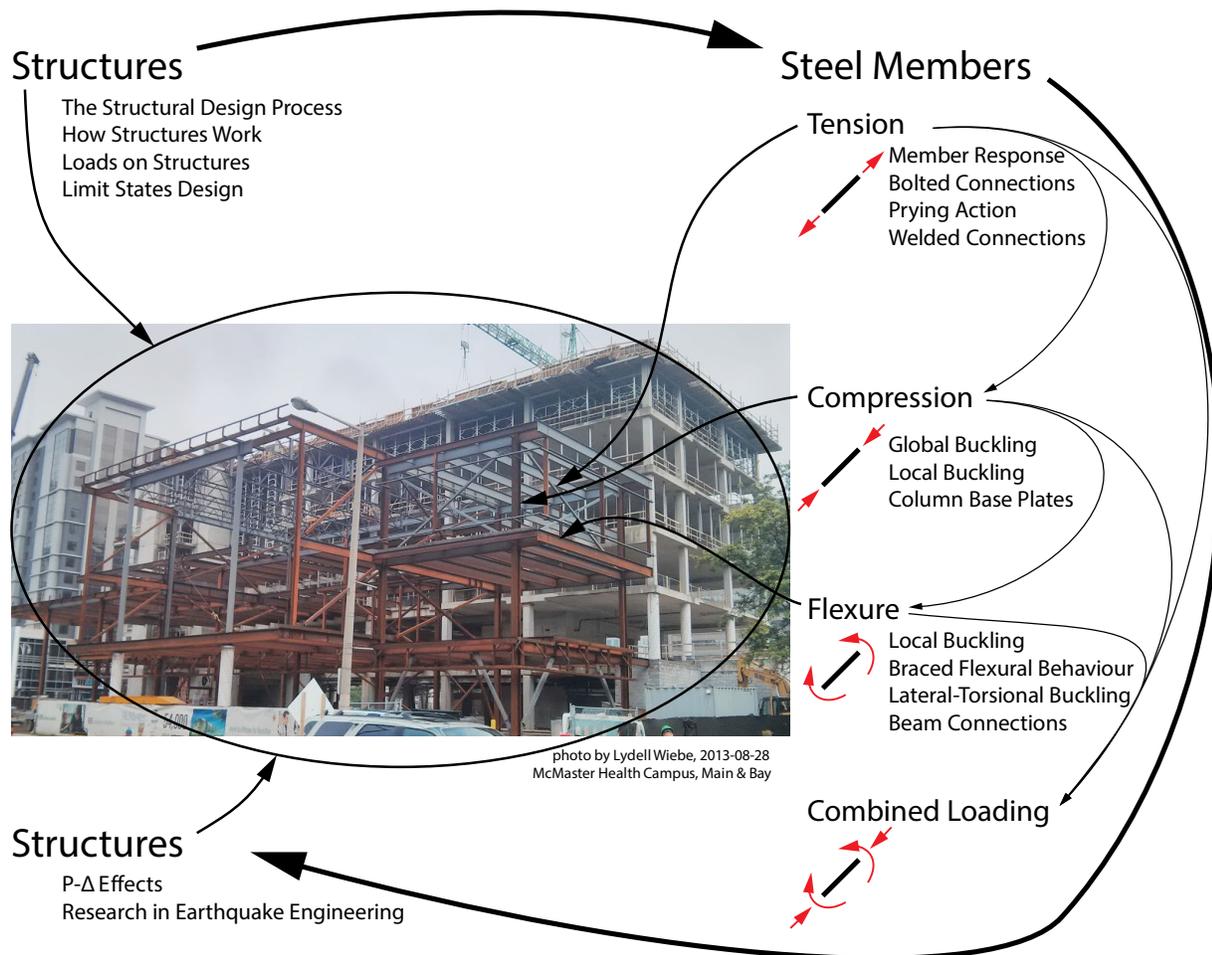
Lectures and online tutorials will be recorded and posted on the password-secured course website. If you participate in an identifiable way, you are consenting to the recording being used as noted above. Please contact the instructor about any concerns you may have.

Website:	On Avenue to Learn (http://avenue.mcmaster.ca). Please sign up immediately because important information and course documents will be posted there. It is your responsibility to check the course website regularly.
Email:	The general email address for this course is CE4N04@mcmaster.ca. You can expect a response from TAs within 1 business day, or from the instructor within 3 business days.
TA Office Hours:	Tuesdays 12:30-1:30 in JHE 329A or Zoom – This is best for specific questions related to the next assignment, as the TA grading the assignment will be available.
Instructor Office Hours:	Thursdays at 9-10 am in JHE 333 or Zoom – This is a backup for general questions related to course concepts that were not adequately addressed during lecture or tutorial.
Accommodations:	In keeping with university policy (see Section 7), I am happy to work with you to arrange accommodations that may be needed to help you achieve your learning goals for this course. Please do not be afraid to reach out to discuss your unique circumstances.

1. COURSE OBJECTIVES

Please refer to Section 5 for the Learning Outcomes of this course, and to the figure below for an overview of it. The first 2-3 weeks will focus on aspects of structural design that are common to all materials: how structures carry loads, how to calculate those loads using the National Building Code of Canada (NBC 2015), and the principles of Limit States Design.

The majority of the course will be spent on the behaviour and design of individual steel members according to the Canadian steel specification CSA S16:19. We will start by discussing the behaviour and design of steel members in tension, including bolted and welded connections for such members. Next, we will consider the behaviour of steel members in compression. Bending members, which carry loads through a combination of tension and compression, will be our next topic. Finally, we will study situations with combined flexural and axial loading. As time permits, we may also discuss P-Delta effects and current research in earthquake engineering.



COURSE OUTLINE

2. COURSE SPECIFIC POLICIES

My goal in every class is to provide the best possible environment for everyone in the class to become competent structural engineering professionals. In order to do this, I ask you to treat meetings of this class as you would treat meetings that with your supervisor in an engineering design office. This includes the following expectations:

- **Arrive on time.** Plan for the possibility of transport delays. But if you are late, minimize the disruption you cause by quickly and quietly finding a seat near the aisle.
- **Come prepared to work.** Check the course website before coming and expect to participate actively in every class, including have a calculator with you.
- **Be quiet during class**, except when asked to speak with your classmates. Otherwise, if you have a question, please raise your hand so that I can answer it for everyone.
- **Turn off all electronic devices during class, unless you are taking notes on it.** I will check.
- **Speak and write with respect.** Use your words and actions to build other people up; avoid saying things that are likely to be considered offensive.

If you are disrupting the class, I may have to ask you to leave the class. I may also need to meet with you and the Chair of the Department.

If you are bothered by the behaviour of other students, please let me know so that I can address your concerns.

Books

Required: *Handbook of Steel Construction, 12th Edition.* Canadian Institute of Steel Construction, Markham ON. **Unfortunately, the 11th Edition will not be adequate.**

Recommended: Kulak GL, Grondin GY. 2021. *Limit States Design in Structural Steel. 11th Edition.* Canadian Institute of Steel Construction, Markham ON.

Both of the above books are available from the [CISC's Steel Store](https://steelstore.cisc-icca.ca/) (<https://steelstore.cisc-icca.ca/>).

The Student Discount Code for the Required Handbook is: D9FDRAMS4MM0WIE (valid Aug 31-Oct 1)

Recommended: Metten AWF, Driver RG. 2015. *Structural Steel for Canadian Buildings. 3rd Ed.* Structured Solutions.

Extreme Circumstances and Other Modifications

In accordance with McMaster Policy as noted in Section 7, the instructor may adjust the lecture and assessment schedule during the term. If this happens, the class will be given reasonable notice, an explanation, and an opportunity to comment, although the instructor will not necessarily make changes in response to comments received. It is your responsibility to stay informed of changes by attending all lectures and by checking the course website regularly.

Academic Integrity

As an example of the Academic Integrity Policy (Section 7), most assignments in this course will have slightly different numerical questions for each group member. Discussing your solution technique with your group members is encouraged, but copying some or all of the solution from another student who has the same numerical problem as you is considered an example of academic dishonesty. The midterm and the final exam are expected to be completed independently; both receiving and giving information regarding these assessments before all students have completed them are considered examples of academic dishonesty. **You will be required to attest to having read and agreed to the Integrity Policy as part of everything you wish to receive credit for in this course.**

Equity, Diversity, and Inclusion

In keeping with the Anti-Discrimination Policy (Section 7), I want to note that you have a right to an environment that is free of discrimination and harassment. If you have any concerns, please do not hesitate to contact me or a human rights officer (<https://equity.mcmaster.ca/>). Like many people, I am still in the process of learning about diverse perspectives and identities. If something was said in class (by anyone, including me) that made you feel uncomfortable, it is always an option to speak to me about it or to send anonymous feedback.

3. APPROXIMATE SCHEDULE

Week	Lecture Topics (subject to change without notice)	Due Dates (subject to change without notice)
1. Sep 6	Structural Design	
2. Sep 13	Load Paths, Gravity Loads	
3. Sep 20	Lateral Loads, Limit States Design	Sep 22: Assignment 1
4. Sep 27	Tension Members: Failure Surfaces	Sep 29: Assignment 2
5. Oct 4	Tension Members: Bolted Connections	
Oct 11	Midterm Recess: No Lectures or Tutorial	
6. Oct 18	Bolts in Tension and Shear	Oct 20: Assignment 3
7. Oct 25	Welded Connections	Oct 29: Midterm Exam
8. Nov 1	Introduction to Compression Members	Nov 5: Assignment 4
9. Nov 8	Torsional and Local Buckling of Compression Members	
10. Nov 15	Introduction to Flexural Members	Nov 17: Assignment 5
11. Nov 22	Shear and Deflections in Beams	
12. Nov 29	Combined Axial and Flexural Loading	Dec 1: Assignment 6
13. Dec 6	Course Wrap-Up	Dec 8: Project; Assignment 7
FINAL EXAMINATION	Scheduled during the regular University Final Examination period established by the Registrar's Office	

COURSE OUTLINE

4. ASSESSMENT OF LEARNING	WEIGHT
Final Exam (to be scheduled by the Registrar's Office)	50%
Midterm Exam (October 29 during Tutorial Time)	20% ¹
Design Project & Assignments There will be approximately 7 assignments throughout the term, worth a total of 25% of your final grade. These assignments will include both individual (80% of each assignment) and group work (20% of each assignment) components. Most assignments will involve phases of the design project, which encompasses the design of a low-rise steel structure. All group members will receive the same grade for the group work portion only. The final group project report will be worth 5% of your final grade. It will include structural drawings and a discussion of the selected design solutions.	30%
Notes: <ol style="list-style-type: none"> Drop the Midterm: For each student, a non-zero midterm exam grade will be replaced with the final exam grade if it is to that student's benefit. Late submissions: If an assignment will be accepted after the regular deadline, the deadline for late submissions will be listed on the assignment. A deduction of 20% will apply (e.g. a student who scores 80% on the assignment will receive 60% if it is submitted late). Discussions of Feedback: You are encouraged to discuss the feedback that you receive on any assessment with your TAs or the course instructor. If you believe that you have received an incorrect grade on any piece of assessment, you must return it to the person who marked it, together with a written explanation of why you believe the grade was incorrect, within one week of the day that the assessment was returned. This may result in the grade increasing, decreasing, or remaining the same. MSAFs: In accordance with university policy (see Section 7), the McMaster Student Absence Form (MSAF) will only be accepted if you email the course instructor within one week after the due date of the assignment. When accommodations are made, they will be confirmed by email from the course instructor; any grades that are missing on the course website will be counted as zero when calculating your final grade unless you have received email confirmation otherwise. The weight of any missed term work will normally be deferred to the final exam. Submission: All assessments will be submitted and timestamped online through the course website. 	

5. LEARNING OUTCOMES

When you have successfully completed this course, you will be able to:

- identify key elements of steel structures, such as braces, columns, and beams [CEAB Indicator 1.4]
- calculate the forces in these members using fundamental principles of engineering statics, including strategies for solving trusses and for drawing shear force and bending moment diagrams [CEAB Indicator 1.3]
- describe the limit states of these elements and their connections using words, sketches, and calculations [CEAB Indicators 1.4 and 7.1]
- navigate the CISC Handbook of Steel Construction [CEAB Indicator 1.4]
- apply this fundamental and specialized engineering knowledge to solve unfamiliar problems in steel design [CEAB Indicator 3.2]
- design steel elements using the current Canadian steel specification, S16-14, to resist the loading conditions specified by the current National Building Code of Canada, NBC 2015 [CEAB Indicators 1.4 and 2.3]
- identify the assumptions that are required to design these elements and the limitations of the equations that are used for analysis and design [CEAB Indicators 2.1 and 2.3]
- integrate the design of individual structural elements into a larger project, and communicate the design, including its context and limitations, using writing and drawings [CEAB Indicators 2.3 and 7.1]

If you achieve these objectives, you will be able to contribute meaningfully to the work that structural engineers do, whether in a design office or in academia.

Graduate Attributes and CEAB Indicators

Through this course, you will develop in the following graduate attributes and indicators:

1. A knowledge base for engineering (Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.)
 - 1.3 Competence in Engineering Fundamentals
 - 1.4 Competence in Specialized Engineering knowledge
2. Problem analysis (An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.)
 - 2.1 Demonstrates an ability to identify reasonable assumptions (including identification of uncertainties and imprecise information) that could or should be made before a solution path is proposed.
 - 2.3 Obtains substantiated conclusions as a result of a problem solution including recognizing the limitations of the solutions.
3. Investigation (An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.)
 - 3.2 Selects appropriate model and methods and identifies assumptions and constraints.
7. Communication Skills (An ability to communicate complex engineering concepts within the profession and with society at large. Such abilities include reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.)
 - 7.1 Demonstrates an ability to respond to technical and non-technical instructions and questions.

6. LABORATORY SAFETY

The Faculty of Engineering is committed to McMaster University's Workplace and Environmental Health and Safety Policy which states: "Students are required by University policy to comply with all University health, safety and environmental programs and policies". It is your responsibility to understand McMaster University Workplace and Environmental Health and Safety programs and policies. For information on these programs and policies please refer to McMaster University Environmental and Health Support Services [Occupational Safety Risk Management Manual](#). It is also your responsibility to follow any specific Standard Operating Procedures (SOPs) provided for specific experiments (see course lab manuals) and the laboratory equipment (see Department Safety Manual). McMaster University's workplace [health and safety guidance related to COVID-19](#) should always be followed.

The safety requirements for the ADL are listed below. Students not abiding by these safety requirements will be given one warning. Second offences will result in the student being asked to vacate the laboratory and receiving a grade of zero for that particular lab.

- Green Patch safety boots, hard hats, and safety glasses must be worn at all times. Note that students supply their own safety boots. Hard hats and safety-glasses are available in the lab. Prescription eye-glasses are only considered as safety glasses if they have side shields.
- Maintain a safe distance from the universal tester while the sample is being loaded.
- No one will create a situation that could compromise or jeopardize the safety of themselves or anyone else in the lab. Obey all instructions given to you by the Teaching Assistant and/or lab technical staff.
- No running is allowed.

7. 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.

8. POLICIES

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. **It is your responsibility to understand what constitutes academic dishonesty.**

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. For information on the various types of academic dishonesty please refer to the [Academic Integrity Policy](https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/), located at <https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/>.

The following illustrates only three forms of academic dishonesty:

- plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.
- improper collaboration in group work.
- copying or using unauthorized aids in tests and examinations.

AUTHENTICITY / PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. **All submitted work is subject to normal verification that standards of academic integrity have been upheld** (e.g., on-line search, other software, etc.). For more details about McMaster’s use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, 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 a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure, please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/software during tests or exams. This software may be required to be installed before the test/exam begins.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described in the [Code of Student Rights & Responsibilities](#) (the “Code”). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, **whether in person or online**.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students’ access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact [Student Accessibility Services](#) (SAS) at 905-525-9140 ext. 28652 or sas@mcmaster.ca to make arrangements with a Program Coordinator. For further information, consult McMaster University’s [Academic Accommodation of Students with Disabilities](#) policy.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

[McMaster Student Absence Form \(MSAF\)](#): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar “Requests for Relief for Missed Academic Term Work”.

The McMaster Student Absence Form is a self-reporting tool for **Undergraduate Students** to report absences that last up to 5 days and provides the ability to request accommodation for any missed academic work. Please note, this tool cannot be used during any final examination period. You may submit a maximum of 1 Academic Work Missed requests per term. It is **your** responsibility to follow up with your Instructor immediately regarding the nature of the accommodation. If you are absent more than 5 days or exceed 1 request per term you **must** visit your Associate Dean's Office (Faculty Office). You may be required to provide supporting documentation. This form should be filled out immediately when you are about to return to class after your absence.

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the [RISO](#) policy. Students should submit their request to their Faculty Office **normally within 10 working days** of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, **including lectures** by University instructors.

The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

PROTECTION OF PRIVACY ACT (FIPPA)

The Freedom 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 the posting of grades must be done in a manner that ensures confidentiality – see <http://www.mcmaster.ca/univsec/fippa/fippa.cfm>.

ANTI-DISCRIMINATION

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. [https://www.mcmaster.ca/policy/General/HR/Discrimination and Harassment.pdf](https://www.mcmaster.ca/policy/General/HR/Discrimination%20and%20Harassment.pdf)

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

9. MCMASTER GRADING SCALE

Grade	Equivalent Grade Point	Equivalent Percentages
A+	12	90-100
A	11	85-89
A-	10	80-84
B+	9	77-79
B	8	73-76
B-	7	70-72
C+	6	67-69
C	5	63-66
C-	4	60-62
D+	3	57-59
D	2	53-56
D-	1	50-52
F	0	0-49