

**MECHANICAL ENGINEERING DEPARTMENT
PRAIRIE VIEW A&M UNIVERSITY**

ASSESSMENT REPORT COVER PAGE

MCEG 3304-P01 MACHINE DESIGN I

Fall 2021 SEMESTER

NAME OF INSTRUCTOR: Dr. Xiaobo Peng

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 - 5.1** Assignments assessing students' ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

Detailed Course Syllabus

Prairie View A&M University
Department of Mechanical Engineering
MCEG 3043-P01 Machine Design I
Fall Semester 2021

CATALOG DESCRIPTION	Fundamentals of mechanical design methodology, design of machine elements for static and fatigue failure, individual projects and classroom discussions of various design solutions.
COURSE NO	MCEG 3304
SECTION	P01
CREDIT	3 Credit Hours
INSTRUCTION METHOD	Face-to-Face
PRE-REQUISITES	CVEG 2332 Mechanics of Materials MCEG1102 Mechanical Engineering Lab I
CLASS HOURS	MW 8:00 – 9:50
CLASS ROOM	Hobart Thomas Taylor Sr Hall 1A110
INSTRUCTOR	Dr. Xiaobo Peng
OFFICE	Wilson Engr. Bldg. Room 102A
OFFICE HOURS	M: 10AM ~ 12 Noon; T: 1PM ~ 3PM; Th: 12 Noon ~ 2 PM
TELEPHONE	(936) 261-9959
E-MAIL	xipeng@pvamu.edu
REQUIRED TEXTBOOK	Budynas, R. G. and Nisbett, J. K., <i>Shigley's Mechanical Engineering Design</i> , 11 th edition, McGraw-Hill Book Company, ISBN 9780073398211.
GOALS	This course is designed to introduce students in mechanical engineering to the contemporary mechanical design methodology as applied to machine elements and to the process of mechanical design. The student will design mechanical elements using concepts developed in design of machine elements, engineering graphics and other related courses.
OUTCOMES	After completion of this course, the students should be able to apply

the design processes to mechanical elements, using contemporary design standards and tools and have developed the following:

1. Skills for mechanical element design;
2. An ability to analyze mechanical engineering elements;
3. Knowledge of various machine elements;
4. An ability to complete a mechanical design project.

TOPICS

- (1) Introduction/Basics.
- (2) Design Process and Project Management
- (3) Material, Load and stress analysis
- (4) Deflection and stiffness
- (5) Failures resulting from static loading
- (6) The design of screws, fasteners, and connections
- (7) Rolling contact bearings

GRADING

The final grade will be computed according to the following weight distribution:

Homework	5%
Project	5%
Quiz	10%
Exam 1	25%
Exam 2	25%
Final exam	30%

The distribution of grades will be as follows:

A = 90 - 100
B = 80 - 89
C = 70 - 79
D = 60 - 70
F = 0 - 59

COURSE POLICY

Note: The instructor reserves the right to alter it during the semester.

Use of Canvas (<http://ecourses.pvamu.edu>)

Canvas will be used extensively in this class. Lecture slides, assignment, and tutorials will be provided on Canvas.

Academic Integrity

Academic dishonesty of any sort (plagiarism, cheating, fabrication or facilitation) is prohibited under any circumstance. **Any detected actions of dishonesty will cause the failure of the class directly.**

Use of Connect for homework

- **Connect will be used to submit homework.**
- **<https://connect.mheducation.com/class/x-peng-p01-2>**

Assignments & Due Dates

Late homework will be charged a **10%** penalty for **each** day late – weekend days do count. Circumstances beyond your control (i.e. illness, computer failure, weather, etc.) will be considered as required.

Projects

You need to submit all the projects with electronic copy **via Taskstream**.

Attendance

Class attendance is mandatory. Excessive absenteeism, whether excused or unexcused, may result in a student's course grade being reduced or in assignment of a grade of "F".

Examinations

Neither **programmable calculator** nor **calculator which can save pictures** is allowed during exams. **No cell phone** can be kept in your pocket during exams. Portions of each exam may be either closed or open book. You will be notified of the exam format at least one week in advance.

Technical Support

PVAMU IT Helpdesk: For IT-related issues and problems, such as campus Wi-Fi access, email & PantherTrack access. The helpdesk is available 24 hours a day/7-days a week. Contact at (936)261-2525 or helpdesk@pvamu.edu.

Office of Distance Learning : Regarding any online course and Zoom related questions, students should contact 936-261-3290 or 936-261-3282 or ciits@pvamu.edu.

John B. Coleman Library: The library maintains library collections and access both on campus, online, and through local agreements to further the educational goals of students and faculty. Phone: 936-261-1500; [Website \(Links to an external site.\) \(Links to an external site.\)](#)

University Bookstore: Telephone: (936) 261-1990; [Website \(Links to an external site.\)](#)

IMPORTANT DATES

Last day to withdraw from course(s) without record,	9/7/2021
Withdrawal from courses with record "W" ends,	11/1/2021
Last class day,	12/1/2021
Final exam period,	12/2-8/2021

How Mechanical Engineering Courses meet Department Objectives & ABET Criterion 3
Specific Objectives of the Mechanical Engineering Program (**MCEG Objectives**) at Prairie View A&M are to produce graduates who have:

1. have the necessary knowledge and skills to enable them have successful careers in mechanical engineering and related fields;
2. have leadership skills to advance their careers through increasing levels of responsibilities and leadership;
3. have the necessary educational background to successfully pursue graduate or advanced professional degrees and continuing professional development, and
4. actively participate in professional and community services.

ABET Criterion 3: Program Outcomes and Assessment

Engineering Programs must demonstrate that their graduates have:

- (a) an ability to identify, formulate, and solve **complex engineering problems** by applying principles of engineering, science, and mathematics.
- (b) an ability to **apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.**
- (c) ability to communicate effectively with a range of audiences.
- (d) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
- (e) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
- (f) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- (g) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The table below shows how required Mechanical Engineering courses at Prairie View A&M University contribute to the student's knowledge and ability to meet ABET criterion 3.

MCEG Courses	ABET EAC Criteria 1-7							
	Fall 2018	Spring 19	Fall 2019	Spring 2020	Fall 2020	Spring 2021	Fall 2021	Spring 2022
1102 Mech. Drawing & Desg.	2*	2*	2*	2*	2*		2*	
2301 Thermodynamics I	1*	1*	1*	1*	8*		8*	
2303 Materials Sci/Engr.	1*	1*	1*	1*		8*		8*
2302 Engineering Mechanics II	1*	1*	1*	1*	8*		8*	

3101 Measurement Lab		6		6	7	6	7	6
3301 Heat Transfer	1		1		2	1	2	1
3102 Thermal Sci. Lab	6	6	6	6		6		6
3302 Thermodynamics II	1	1	1	1		2		2
3103 Manufacturing Lab		2		4		2		4
3303 Manufacturing Proc		2		4		2		4
3304 Machine Design I	2		2		2		2	
3305 Kinematic Design	1		1		1		1	
3306 Fluid Mechanics	1	6	1	6	1	6	1	6
4304 Machine Design II	2		2		2		2	
4306 Dynamic Systems		1		1		1		1
4309 Finite Element	1		1		1		1	
4247 Senior Project I	4, 5		4, 5		4, 5		4, 5	
4248 Senior Project II		2,3,7		2,3,7		2,3,7		2,3,7

MCEG 3043 Course Objectives and Anticipated Outcomes

Course Objectives

1. Apply the concepts of stress analysis, theories of failure and material science to analyze, design and/or select commonly used machine components. (1, 3)

Anticipated Outcomes:

The students will be able to design a component and system and to analyze mechanical engineering systems. (ABET Outcome 2)

2. Apply computer based techniques in the analysis, design and/or selection of machine components. (1, 3)

Anticipated Outcomes:

The students will be able to using software to design mechanical elements and system, write technical project reports and make technical presentations. (ABET Outcome 2)

Machine Design I

Tentative Course Schedule

Week	Date	Meeting Method	TOPICS	Chapter
Week 1	8/23/21	Face to Face	INTRODUCTION/BASICS Design considerations, codes and standards, stress and strength considerations, factor of Safety, units, etc.	1
	8/25/21	Face to Face	MATERIALS	2
Week 2	8/30/21	Face to Face	LOAD AND STRESS ANALYSIS Free-body diagrams	3
	9/1/21	Face to Face	LOAD AND STRESS ANALYSIS Shear force and bending moment diagram	3
Week 3	9/6/21		Labor day, no class	
	9/8/21	Face to Face	LOAD AND STRESS ANALYSIS Stress, Cartesian stress components	3
Week 4	9/13/21	Face to Face	LOAD AND STRESS ANALYSIS Mohr's circle	3
	9/15/21	Face to Face	LOAD AND STRESS ANALYSIS Mohr's circle	3
Week 5	9/20/21	Face to Face	LOAD AND STRESS ANALYSIS 3D Mohr's circle	3
	9/22/21	Face to Face	LOAD AND STRESS ANALYSIS General stress-dimensional stress, Normal stresses for beams in bending	3
Week 6	9/27/21	Face to Face	LOAD AND STRESS ANALYSIS General stress-dimensional stress, Normal stresses for beams in bending	3
	9/29/21	Face to Face	LOAD AND STRESS ANALYSIS Shear stresses for beams in bending	3

Week 7	10/4/21	Face to Face	LOAD AND STRESS ANALYSIS Torsion	3
	10/6/21	Face to Face	DEFLECTION AND STIFFNESS Spring rates, Tension, compression, and torsion	4
Week 8	10/11/21	Face to Face	Exam One	
	10/13/21	Face to Face	DEFLECTION AND STIFFNESS Deflection due to bending, Beam deflection methods Finding beam deflections by superposition	4
Week 9	10/18/21	Face to Face	FAILURES RESULTING FROM STATIC LOADING Failure theories, Maximum-shear-stress theory for ductile materials	5
	10/20/21	Face to Face	FAILURES RESULTING FROM STATIC LOADING Distortion-energy theory for ductile materials	5
Week 10	10/25/21	Face to Face	FAILURES RESULTING FROM STATIC LOADING Failure of ductile materials	5
	10/27/21	Face to Face	THE DESIGN OF SCREWS, FASTENERS, AND CONNECTIONS Threaded fasteners	8
Week 11	11/1/21	Face to Face	Exam Two	
	11/3/21	Face to Face	THE DESIGN OF SCREWS, FASTENERS, AND CONNECTIONS Joints – fastener stiffness	8
Week 12	11/8/21	Face to Face	THE DESIGN OF SCREWS, FASTENERS, AND CONNECTIONS Joints – member stiffness	8
	11/10/21	Face to Face	THE DESIGN OF SCREWS, FASTENERS, AND CONNECTIONS Bolt strength, Tension connections – the external load, Relating Bolt Torque to Bolt Tension	8
Week 13	11/15/21	Face to Face	THE DESIGN OF SCREWS, FASTENERS, AND	8

			CONNECTIONS Statically Loaded Tension Joint with Preload	
	11/17/21	Face to Face	ROLLING-CONTACT BEARINGS Bearing types, Bearing life, Bearing load life	11
Week 14	11/22/21	Face to Face	ROLLING-CONTACT BEARINGS Combined radial and thrust loading, Mounting and enclosure	11
	11/24/21	Face to Face	Review	
Week 15	11/29/21	Face to Face	Review	
Week 16	TBD	TBD	Final Exam	

Student Support and Success

John B. Coleman Library

The John B. Coleman Library's mission is to enhance the scholarly pursuit of knowledge, to foster intellectual curiosity, and to promote life-long learning and research through our innovative services, resources, and cultural programs, which support the Prairie View A&M University's global mission of teaching, service, and research. It maintains library collections and access both on campus, online, and through local agreements to further the educational goals of students and faculty. Website: <https://www.pvamu.edu/library/>; Phone: 936-261-1500

Academic Advising Services

Academic Advising Services offers students a variety of services that contributes to student success and leads towards graduation. We assist students with understanding university policies and procedures that affect academic progress. We support the early alert program to help students get connected to success early in the semester. We help refer students to the appropriate academic support services when they are unsure of the best resource for their needs. Faculty advisors support some students in their respective colleges. Your faculty advisor can be identified in PantherTracks. Advisors with Academic Advising Services are available to all students. We are located across campus. Find your advisor's location by academic major at www.pvamu.edu/advising. Phone: 936-261-5911

The University Tutoring Center

The University Tutoring Center (UTC) offers free tutoring and academic support to all registered PVAMU students. The mission of the UTC is to help provide a solid academic foundation that enables students to become confident, capable, independent learners. Competent and caring staff and peer tutors guide students in identifying, acquiring, and enhancing the knowledge, skills, and attitudes needed to reach their desired goals. Tutoring and academic support are offered face-to-face in the UTC, in virtual face-to-face sessions (<https://www.pvamu.edu/student-success/sass/university-tutoring-center/>), and through online sessions (<https://www.pvamu.edu/pvplace/>). Other support services available for students include Supplemental Instruction, Study Break, Academic Success Workshops, and Algebra Study Jam. Location: J. B. Coleman Library, Rm. 307; Phone: 936-261-1561; Email: pvtutoring@pvamu.edu; Website: <https://www.pvamu.edu/student-success/sass/university-tutoring-center/>

Writing Center

The Writing Center provides well-trained peer tutors to assist students with writing assignments at any stage of the writing process. Tutors help students with various writing tasks from understanding assignments, brainstorming, drafting, revising, editing, researching, and integrating sources. Students have free access to Grammarly online writing assistance. Grammarly is an automated proofreading and plagiarism detection tool. Students must register for Grammarly by using their student email address. In addition, students have access to face-to-face and virtual tutoring services either asynchronously via email or synchronously via Zoom. Location: J. B. Coleman Library, Rm. 209; Phone: 936-261-3724; Website: <https://www.pvamu.edu/student-success/writing-center/>; Grammarly Registration: <https://www.grammarly.com/enterprise/signup>

Academic Early Alert

Academic Early Alert is a proactive system of communication and collaboration between faculty, academic advisors, and PVAMU students that is designed to support student success by promptly identifying issues and allowing for intervention. Academic Early Alerts help students by providing a central location to schedule advising appointments, view advisor contact information, and request assistance. Students who recognize that they have a problem that is negatively affecting their academic performance or ability to continue school may self-refer an Academic Early Alert. To do so, students will

log in to PV Place and click on Academic Early Alert on the left sidebar. Phone: 936-261-5902; Website: <https://www.pvamu.edu/student-success/early-alert/>

Student Counseling Services

The Student Counseling Services unit offers a range of services and programs to assist students in maximizing their potential for success: short-term individual, couples, and group counseling, as well as crisis intervention, outreach, consultation, and referral services. The staff is licensed by the State of Texas and assists students who are dealing with academic skills concerns, situational crises, adjustment problems, and emotional difficulties. Information shared with the staff is treated confidentially and in accordance with Texas State Law. Location: Hobart Taylor, 2nd floor; Phone: 936-261-3564; Website: <https://www.pvamu.edu/healthservices/student-counseling-services/>

Office of Testing Services

Testing Services serves to create opportunities by offering a suite of exams that aid in the students' academic and professional success. Currently, we administer entrance (HESI A2), college readiness (TSI assessment), Prior Learning (CLEP, DSST), and proctored exams. Location: Wilhelmina Delco, 3rd Floor, Rm. 305; Phone: 936-261-3627; Email: aetesting@pvamu.edu; Website: www.pvamu.edu/testing

Office of Diagnostic Testing and Disability Services

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, contact the Office of Disability Services. As a federally-mandated educational support unit, the Office of Disability Services serves as the repository for confidential disability files for faculty, staff, and students. For persons with a disability, the Office develops individualized ADA letters of request for accommodations. Other services include learning style inventories, awareness workshops, accessibility pathways, webinars, computer laboratory with adapted hard and software, adapted furniture, proctoring non-standardized test administrations, ASL interpreters, ALDs, digital recorders, Livescribe, and a comprehensive referral network across campus and the broader community. Location: Hobart Taylor, Rm. 1D128; Phone: 936-261-3583; Website: <https://www.pvamu.edu/disabilityservices/>

Center for Instructional Innovation and Technology Services (CIITS)

Distance Learning, also referred to as Distance Education, is the employment of alternative instructional delivery methods to extend programs and services to persons unable to attend college in the traditional manner. The Center for Instructional Innovation and Technology Services (CIITS) supports student learning through online, hybrid, web-assist, and 2-way video course delivery. For more details and contact information, visit:

<https://www.pvamu.edu/dlearning/distance-learning-2-2/students-2/>; Phone: 936-261-3283

Veteran Affairs

Veterans Services works with student veterans, current military and military dependents to support their transition to the college environment and continued persistence to graduation. The Office coordinates and certifies benefits for both the G.I. Bill and the Texas Hazlewood Act. Location: Evans Hall, Rm. 102; Phone: 936-261-3563; Website: <https://www.pvamu.edu/sa/departments/veteranaffairs/>

Office for Student Engagement

The Office for Student Engagement delivers comprehensive programs and services designed to meet the co-curricular needs of students. The Office implements inclusive and accessible programs and services

that enhance student development through exposure to and participation in diverse and relevant social, cultural, intellectual, recreational, community service, leadership development, and campus governance. Location: Memorial Student Center, Rm. 221; Phone: 936-261-1340; Website: <https://www.pvamu.edu/studentengagement/>

Career Services

Career Services supports students through professional development, career readiness, and placement and employment assistance. The Office provides one-on-one career coaching, interview preparation, resume and letter writing, and career exploration workshops and seminars. Services are provided for students at the Northwest Houston Center and College of Nursing in the Medical Center twice a month or on a requested basis. Distance Learning students are encouraged to visit the Career Services website for information regarding services provided. Location: Anderson Hall, 2nd floor; Phone: 936-261-3570; Website: <https://www.pvamu.edu/careerservices/>

University Rules and Procedures

Academic Misconduct

Academic dishonesty is defined as any form of cheating or dishonesty that has the effect or intent of interfering with any academic exercise or fair evaluation of a student's performance. The college faculty can provide additional information, particularly related to a specific course, laboratory, or assignment.

You are expected to practice academic honesty in every aspect of this course and all other courses. Make sure you are familiar with the *University Administrative Guidelines on Academic Integrity*, which can be found on the [Academic Integrity webpage](#). Students who engage in academic misconduct are subject to university disciplinary procedures. As listed in the *University Administrative Guidelines on Academic Integrity*, the University Online Catalog, and the Student Code of Conduct, the following are examples of prohibited conduct. This list is not designed to be all-inclusive or exhaustive. In addition to academic sanctions, any student found to have committed academic misconduct that is also a violation of criminal law may also be subject to disciplinary review and action by the Office of Student Conduct (as outlined in the Student Code of Conduct).

Forms of Academic Dishonesty:

1. **Cheating**: Deception in which a student misrepresents that he/she has mastered information on an academic exercise that he/she has not learned, giving or receiving aid unauthorized by the instructor on assignments or examinations. Examples: unauthorized use of notes for a test; using a "cheat sheet" on a quiz or exam; any alteration made on a graded test or exam which is then resubmitted to the teacher;
2. **Plagiarism**: Careless or deliberate use of the work or the ideas of another; representation of another's work, words, ideas, or data as your own without permission or appropriate acknowledgment. Examples: copying another's paper or answers, failure to identify information or essays from the internet and submitting or representing it as your own; submitting an assignment which has been partially or wholly done by another and claiming it as yours; not properly acknowledging a source which has been summarized or paraphrased in your work; failure to acknowledge the use of another's words with quotation marks;
3. **Collusion**: When more than one student or person contributes to a piece of work that is submitted as the work of an individual;

4. Conspiracy: Agreeing with one or more persons to commit an act of academic/scholastic dishonesty; and
5. Multiple Submission: Submission of work from one course to satisfy a requirement in another course without explicit permission. Example: using a paper prepared and graded for credit in one course to fulfill a requirement and receive credit in a different course.

Nonacademic Misconduct

The university respects the rights of instructors to teach and students to learn. Maintenance of these rights requires campus conditions that do not impede their exercise. Campus behavior that interferes with either (1) the instructor's ability to conduct the class, (2) the inability of other students to profit from the instructional program, or (3) campus behavior that interferes with the rights of others will not be tolerated. An individual engaging in such disruptive behavior may be subject to disciplinary action. The Office of Student Conduct will adjudicate such incidents under nonacademic procedures.

Sexual Misconduct

Sexual harassment of students and employees at Prairie View A&M University is unacceptable and will not be tolerated. Any member of the university community violating the university's sexual harassment policy will be subject to disciplinary action. In accordance with the Texas A&M University System guidelines, your instructor is obligated to report to the Office of Title IX Compliance (titleixteam@pvamu.edu) any instance of sexual misconduct involving a student, which includes sexual assault, stalking, dating violence, domestic violence, and sexual harassment, about which the instructor becomes aware during this course through writing, discussion, or personal disclosure. The faculty and staff of PVAMU actively strive to provide a learning, working, and living environment that promotes respect that is free from sexual misconduct, discrimination, and all forms of violence. If students, faculty, or staff would like assistance or have questions, they may contact the Title IX Coordinator at 936-261-2144 or titleixteam@pvamu.edu. More information can be found at www.pvamu.edu/titleix, including confidential resources available on campus.

Pregnancy, Pregnancy-related, and Parenting Accommodations

Title IX of the Education Amendments of 1972 prohibits sex discrimination, which includes discrimination based on pregnancy, marital status, or parental status. Students seeking accommodations related to pregnancy, pregnancy-related conditions, or parenting (reasonably immediate postpartum period) are encouraged to contact Student Disability Services or the Dean of Students' Office for additional information and to request accommodations.

Non-Discrimination Statement

Prairie View A&M University does not discriminate on the basis of race, color, sex, religion, national origin, age, disability, genetic information, veteran status, sexual orientation, or gender identity in its programs and activities. The University is committed to supporting students and complying with The Texas A&M University System non-discrimination policy. It seeks to establish an environment that is free of bias, discrimination, and harassment. If you experience an incident of discrimination or harassment, we encourage you to report it. If you would like to speak with someone who may be able to afford you privacy or confidentiality, there are individuals who can meet with you. The Director of Equal Opportunity & Diversity has been designated to handle inquiries regarding the non-discrimination policies and can be reached at Harrington Science Building, Suite 109 or by phone at 936-261-1744 or 1792.

Class Attendance Policy (See the University Online Catalog for Full Attendance Policy)

Prairie View A&M University requires regular class attendance. Attending all classes supports the full academic development of each learner, whether classes are taught with the instructor physically present or via distance learning technologies such as interactive video and/or the internet. Excessive absenteeism, whether excused or unexcused, may result in a student's course grade being reduced or in the assignment of a grade of "F." Absences are accumulated beginning with the first day of class during regular semesters and summer terms. Each faculty member will include the University's attendance policy in each course syllabus.

Student Academic Appeals Process

Authority and responsibility for assigning grades to students rest with the faculty. However, in those instances where students believe that miscommunication, errors, or unfairness of any kind may have adversely affected the instructor's assessment of their academic performance, the student has a right to appeal by the procedure listed in the University Online Catalog and by doing so within thirty days of receiving the grade or experiencing any other problematic academic event that prompted the complaint.

Technical Considerations

Minimum Recommended Hardware and Software:

- Intel PC or Laptop with Windows 10 or later version; Mac with OS High Sierra*
- Smartphone or iPad/Tablet with Wi-Fi*
- High-speed Internet access
- 8 GB Memory
- Hard drive with 320 GB storage space
- 15" monitor, 800x600, color or 16 bit
- Sound card w/speakers
- Microphone and recording software
- Keyboard & mouse
- Most current version of Google Chrome, Safari, or Firefox

Note: Be sure to enable Java & pop-ups in the Web browser preferences

* Smartphones, Google Chrome books, and Android tablets may not be supported. iPads are the only tablets supported.

Participants should have a basic proficiency of the following computer skills:

- Sending and receiving email
- A working knowledge of the Internet
- Microsoft Word (or a program convertible to Word)
- Acrobat PDF Reader
- Windows or Mac OS
- Video conferencing software

Netiquette (online etiquette)

Students are expected to participate in all discussions and virtual classroom chats as directed. Students are to be respectful and courteous to others on discussion boards. Foul or abusive language will not be tolerated. Do not use ALL CAPS for communicating to others AS IT CAN BE INTERPRETED AS YELLING. Avoid slang terms such as "wassup?" and texting abbreviations such as "u" instead of "you." Limit and possibly avoid the use of emoticons. Be cautious when using humor or sarcasm as tone is sometimes lost in an email or discussion post, and the message might be taken seriously or sound offensive.

Video Conferencing Etiquette

When using Zoom, WebEx, or other video conferencing tools, confirm the visible area is tidy, clear of background clutter, inappropriate or offensive posters, and other distractions. Ensure you dress appropriately and avoid using high traffic or noisy areas. Stay muted when you are not speaking and avoid eating/drinking during the session. Before the class session begins, test audio, video, and lighting to alleviate technology issues.

Technical Support

Students should go to <https://mypassword.pvamu.edu/> if they have password issues. The page will provide instructions for resetting passwords and contact information if login issues persist. For other technical questions regarding eCourses, call the Center for Instructional Innovation and Technology Services at 936-261-3283 or email ciits@pvamu.edu.

Communication Expectations and Standards

Emails or discussion postings will receive a response from the instructor, usually in less than 48 hours. Urgent emails should be marked as such. Check regularly for responses.

Discussion Requirement

Online courses often require minimal to no face-to-face meetings. However, conversations about the readings, lectures, materials, and other aspects of the course can occur in a seminar fashion. The use of the discussion board will accomplish this. The instructor will determine the exact use of discussion boards.

It is strongly suggested that students type their discussion postings in a word processing application such as Word and save it to their PC or a removable drive before posting to the discussion board. This is important for two reasons: 1) If for some reason your discussion responses are lost in your online course, you will have another copy; 2) Grammatical errors can be greatly minimized by the use of the spell-and-grammar check functions in word processing applications. Once the post(s) have been typed and corrected in the word processing application, copy and paste to the discussion board.

COVID-19 Campus Safety Measures [NOTE: Delete this section when the COVID-19 pandemic is over]

To promote public safety and protect students, faculty, and staff during the coronavirus pandemic, PVAMU has adopted policies and practices to limit virus transmission.

- **Self-monitoring** - Students should follow CDC recommendations for self-monitoring. Students who have a fever or exhibit symptoms of COVID-19 should participate in class remotely and should not participate in face-to-face instruction.
- **Face Coverings** - Face coverings (cloth face covering, surgical mask, etc.) are recommended in classrooms, teaching laboratories, common spaces such as lobbies and hallways, public study spaces, libraries, academic resource, and support offices, and outdoor spaces where 6 feet of physical distancing is challenging to maintain reliably.
- **Physical Distancing** - Physical distancing should be maintained between students, instructors, and others in course and course-related activities where possible.

- **Personal Illness and Quarantine** - Students required to quarantine are to participate in courses and course-related activities remotely and must not attend face-to-face course activities. Students should notify their instructors of the quarantine requirement. Students under quarantine are expected to participate in courses and complete graded work unless they have symptoms that are too severe to participate in course activities. Students experiencing personal injury or illness that is too severe for the student to attend class qualify for an excused absence. To receive an excused absence, students must provide appropriate documentation to the Office for Student Conduct, studentconduct@pvamu.edu.

End of Semester Course Assessment Report

This summary contains the following Information

1. Performance Statistics

- **Total number of students in class**
- **The class average performance (stated as %) in each course outcome assessed in this class and the two previous times course was assessed.**
- **The acceptable class average for the class in each outcome area as set by your Department.**
- **Percentage of students who scored below the expected average in each outcome.**

2. Implementation Summary

- **Brief summary of plans implemented during the semester based on last assessment report**

3. Perceived Problems

- **Instructor's critical evaluation of perceived problems that affected students' performance.**

4. New Plans for Addressing Problems

- **Instructor's plans for addressing the perceived problems the next time the class is taught.**

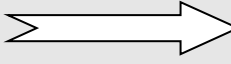
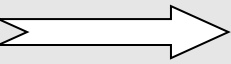
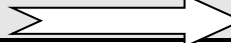
5. Overall Trend over last three assessment periods

- **Instructor's summary of overall performance trend for each outcome measured over the last three periods.**

END OF SEMESTER COURSE OUTCOME ASSESSMENT REPORT
MCEG3304-P01 MACHINE DESIGN I
Fall 2021 SEMESTER

Report Prepared by: Dr. Xiaobo Peng

Report Date: December 13, 2021

Semester	Analysis Type	Number of Students	Outcome (2) Ability to apply engineering design to produce solutions			
			Expected Average	Expected Percent of students at or above average	Class Average	% Students Meeting Expected Average
Fall 2021	Direct	20	70	70	82.6	90%
Fall 2020	Direct	19	70	70	84.05	84.2%
Fall 2019	Direct	15	70	70	81.3	80%
Implementation Summary		The following activities have been implemented to improve the student learning on outcome 2: (1) A series of Tutorials on how to apply engineering design to solve engineering problems are developed and distributed to students; (2) One design project was assigned which required students to use ANSYS software to solve engineering problems; (3) Ecourses was utilized for the class to distribute the tutorials and submit projects.				
Perceived Problems		1. Students lack the abilities in applying the fundamentals to formulate the design problem and to validate the design using analysis. 2. Students showed more enthusiasm on working on the project than working on the homework.				
Plans for Addressing Problems		It is suggested to do the following: (1) More in-class training sessions are needed to give students more training on ANSYS software. (2) More out-of-class tutoring sessions are needed. (3) A tutor is needed to provide help to students.				
Overall Trend over Periods		The overall performance is better than the expected average.				

**Grade Sheet Showing
Student and Class Performance in Outcomes
The computed semester average in each outcome
as stated in the Assessment report are
highlighted in boldface**

**Grade Sheet Showing Student and Class
Performance in Course Outcomes
MCEG 3304-P01 MACHINE DESIGN I
Fall 2021 Semester**

Outcomes to be Measured	Outcome (2)
Title of Assignment	Project
Max. Points for Assignment	100
Name	
1	66.0
2	80.0
3	75.0
4	84.0
5	49.0
6	91.0
7	86.0
8	84.0
9	87.0
10	77.0
11	80.0
12	82.0
13	84.0
14	98.0
15	89.0
16	97.0
17	77.0
18	87.0
19	88.0
20	90.0
Average for all students	82.6
No.of students above expected average	18
Percentage of student above average	90%

OUTCOME SPECIFIC ASSIGNMENTS USED TO ASSESS OUTCOMES

MECHANICAL ENGINEERING DEPARTMENT OUTCOMES SPECIFIC ASSIGNMENT COVER SHEET

MACHINE DESIGN I

FALL 2021

Instructor: Dr. Xiaobo Peng

Title of Assignment

Project 1: Safety Factor of Bolt in Real-life Engineering Application

Outcome Measured Using this Assignment

Outcome 2

An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor

Check the engineering design characteristics related to this assignment

	Involves identifying the specific needs to be met by defining/understanding the problem and developing plans for the project to satisfy the need
	Involves conducting a review of the literature and performing preliminary design by generating alternative ideas/solutions and applying creativity
	Involves performing detailed engineering design leading to specification and fabrication/selection of components for system being designed.
	Involves consideration of one or more of the following (Please check those involved in this assignment.)
	☐ Public health
	X ☒ Safety and welfare
	☐ Global factors
	☐ Cultural factors
	☐ Social factors
	☐ Environmental factors
	☐ Economic factors
	Involves fabrication and testing of model or prototype

Brief justification of the suitability of assignment for the outcome

This project is to apply the Machine Design knowledge in an open-ended real-life engineering application related to bolts. Students need to select the bolt and design the number of bolts needed to be used to satisfy specific safety factor.

MCEG3304: Machine Design I

Fall 2021

Project: Safety Factor of Bolt in Real-life Engineering Application

Assigned on 11/15/2021; Due on 12/1/2021

Total points: 100

1. Introduction

This is an open-ended design project related to the application of bolt. You need to choose one real-life engineering application of bolts and determine the number of bolts required with consideration of safety. The design tasks are defined in Section 2.

2. Design Tasks

In this project, you need to complete the following design tasks.

- (1) Choose one real-life engineering application of bolts with extension loads. The steel cylinder head is shown in Figure 1 as an example. You CAN NOT use steel cylinder head or pressure vessel in Example 8-4 as your design application.

You need to describe (a) what the application is; (b) how the bolts are used in the application; (c) how the extension loads are generated; (d) show a schematic diagram (picture or hand sketch) of the application similar to Figure 1.

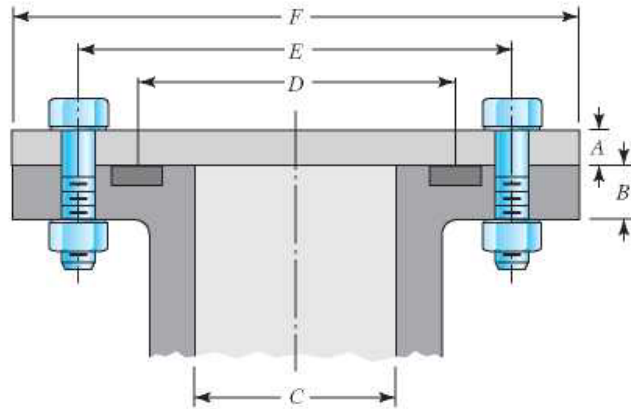


Figure 1. Skematic diagram of steel cylinder head

- (2) Define the given parameters. Table 1 is shown as example for steel cylinder head application. Be aware that your given parameters may be different from Table 1 because your application will be different.

Table 1. Given parameters of steel cylinder head

Parameters	A	B	C	D	p_g	Bolt grade	Bolt spec.
Value	$\frac{1}{2}$ in	$\frac{5}{8}$ in	2.75 in	3.5 in	1500 psi	SAE 5	$\frac{1}{2}$ in-13

You need to define: (a) the bolts specifications, suitable length of the bolt, and bolt grade for the bolt used in the application; (b) the thickness of members and materials of members; (c) the parameters needed to calculate the extension load. All the parameters you defined need to be realistic and need to be justified.

- (3) Calculate k_b , k_m , and C . You need to type detail calculation of the bolt stiffness k_b , stiffness of members k_m , and stiffness constant C . The calculation must be typed in **MS Word using “Equation Editor”**.
- (4) Find the number of bolts required for a load factor of 2 where the bolts may be reused when the joint is taken apart. You need to type the detail calculation in **MS Word using “Equation Editor”**.
- (5) With the number of bolts obtained in part (4), determine the realized load factor for overload, the yielding factor of safety, and the load factor for joint separation.

3. Project Submission

You need to submit soft copy (word file) of your report on **Taskstream** (<http://ecourses.pvamu.edu>). Submit your report to **“Assignment (Outcome 2)”**.

4. Report Format

The report should at least include the following sections:

- a. Cover page;
- b. Abstract;
- c. Problem Description;
- d. Detail Description of Design Tasks; (All calculation should be typed in **MS Word using “Equation Editor”**)
- e. Summary of Results;

5. Grading Scheme

Item	Description	Maximum Points	Your Score
1	Choose one real-life engineering application of bolts with extension loads and describe details of the applications.	15	
2	Define the given parameters and justify your selection.	20	
3	Calculate k_b , k_m , and C .	25	
4	Find the number of bolts required.	10	
5	Determine the realized load factor for overload, the yielding factor of safety, and the load factor for joint separation	10	
6	Overall quality of the report.	20	
	Total	100	

Reference:

1. Example 8-4 and Problem 8-34 in the textbook.

MECHANICAL ENGINEERING DEPARTMENT PRAIRIE VIEW A&M UNIVERSITY



MCEG 3304 MACHINE DESIGN 1

Fall 2021 Section P01

PROJECT REPORT ON

Project: Safety Factor of Bolt in Real-life Engineering Application

Assigned on 11/15/2021; Due on 12/1/2021

Submitted By

Joseph Steele

To

Dr. Xiaobo Peng

No.	First Name	Application(15)	Parameters(20)	kb, km, C(25)	N(10)	nL, np, no (10)	report (20)	total
21	Steele, Joseph	15.0	19.0	25.0	10.0	10.0	18.0	97.0

ABSTRACT

Application of choice: In engineering, there is heavy exponential growth in influence in regards to technological advancements that assist with our daily task. In most workplaces, it is common to see that they are densely populated with computer desktops. Desktops have become significantly faster over decades which have enabled many experts to evaluate many theoretical situations that incorporate intense mathematical applications. Specifically speaking, the innovative advancements of computer components, such as motherboards and central processing units, has led to the increase of allotted storage of inherent engineering information to perform major task.

Bolts in the Application: When discussing the assembly process of technologies concerning desktops, we must address the main components such as the RAM (Random Access Memory), CPU (Central Processing Unit), GPU (Graphics Processing Unit), Power supply, as well as the motherboard. In this project I am using the application of bolts and nuts that are used to fasten the copper material from the motherboard to the back of the steel motherboard plates found on the desktop case that support the loads from the installation of the CPU and the GPU.

How the extension loads are Generated: Once again, when the bolts are fastened, it supports its purpose by supporting the loads of the GPU by keeping the motherboard in place within the desktop casing. This is essential as the Graphics card or GPU, is typically the largest and most dense component in the assembly process. If the bolt cannot suffice the tension received from the GPU, the motherboard would fall out of place and would be unable to function which could also negatively affect other components within the system.

PROBLEM DESCRIPTION

Given the parameters of the members and the bolts used within this application, we must find the suitable length of the bolt, evaluate the thickness of the members, the bolt stiffness, the material stiffness, the yielding factor of safety, load factor of safety, and the safety based on the joint separation.

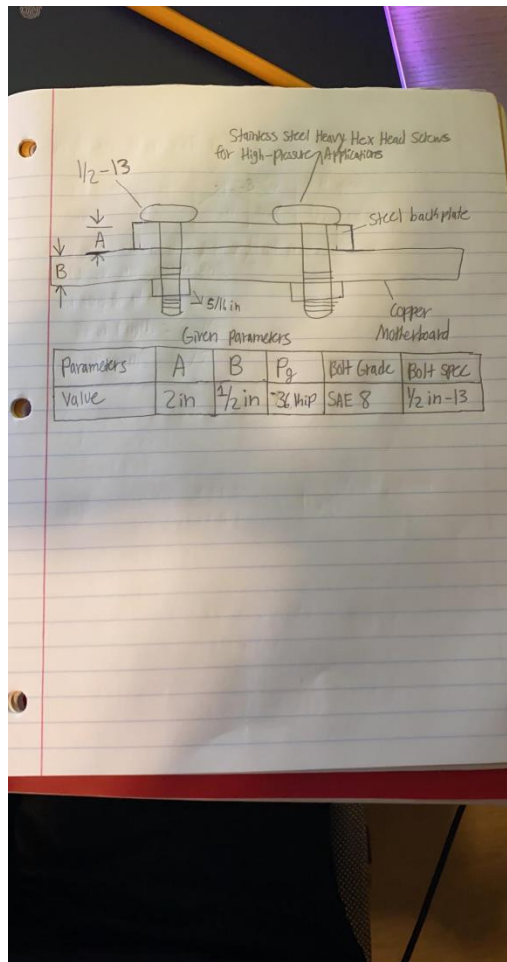
(Copper Motherboard installed inside the Desktop Casing)



(Steel Back Plate Motherboard Attachment)



DETAILED DESCRIPTION OF DESIGN TASK



Parameters	A (Steel member)	B(copper Member)	Pg	BOLT GRADE	BOLT SPEC
Values	2 in	½ in	36 kip	SAE 8	½ IN-13

Explain why Pg=36kip

- 1.) Length of the bolt

$$l = l_1 + l_2$$

$$l = 2 + \frac{1}{2} = 2.5in$$

Height of the nut

Table A-31

$$h = \frac{7}{16} = 0.4375in$$

$$L = l + h$$

$$L = 2.5 + 0.4375 = 2.9375in$$

Round to the nearest quarter inch= 3in

- 2.) Find Kb, bolt stiffness

Table 8-7

$$L_t = 2d + \frac{1}{4}in$$

$$L_t = 2(0.5) + \frac{1}{4} = 1.25in$$

$$l_d = L - L_t$$

$$l_d = 3 - 1.25 = 1.75in$$

$$l_t = l - l_d$$

$$l_t = 2.5 - 1.75 = 0.75in$$

Table 8-2

$$A_t = 0.1419$$

$$A_d = \frac{\pi d^2}{4}$$

$$A_d = \frac{\pi (.5)^2}{4} = .1963in$$

$$k_b = \frac{A_t A_d E}{A_d l_t + A_t l_d}$$

$$k_b = \frac{0.1419 * 0.1963 * 30}{(0.1963 * 0.75) + (0.1419 * 1.75)} = \frac{2.11Mlbf}{in}$$

- 3.) Find km, member stiffness

$$D = 1.5d$$

$$D = 1.5(0.5) = .75$$

$$D1 = .75$$

$$D2 = .75 + 2(2.5 - 2 * \tan 30) = 3.4405$$

$$D3 = .75$$

$$t1 = \frac{l}{2} = 1.25$$

$$t2 = A - t1 = .75$$

$$t3 = .5$$

$$K = \frac{.5774\pi(E)d_1}{\ln\left(\frac{1.155(\omega)+D_1-d_1}{1.155(\omega)+D_1+d_1} \cdot \frac{D_1+d_1}{D_1-d_1}\right)}$$

$$k_1 = \frac{.5774\pi(30)*.5}{\ln\left(\frac{1.155(1.25)+.75-.5}{1.155(1.25)+.75+.5} \cdot \frac{.75+.5}{.75-.5}\right)} = 23.75 \text{ Mlb/in}$$

$$k_2 = \frac{.5774\pi(30)*.5}{\ln\left(\frac{1.155(.75)+3.4405-.5}{1.155(.75)+3.4405+.5} \cdot \frac{3.4405+.5}{3.4405-.5}\right)} = 457.33 \text{ Mlb/in}$$

$$k_3 = \frac{.5774\pi(30)*.5}{\ln\left(\frac{1.155(.5)+.75-.5}{1.155(.5)+.75+.5} \cdot \frac{.75+.5}{.75-.5}\right)} = 19.201 \text{ Mlb/in}$$

$$k_m = \left(\frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3}\right)^{-1} = \left(\frac{1}{23.751} + \frac{1}{457.433} + \frac{1}{19.201}\right)^{-1} = 10.376 \frac{\text{Mlb}}{\text{in}}$$

4.) Calculate Stiffness constant

$$C = \frac{k_b}{k_b + k_m}$$

$$C = \frac{2.11}{2.11 + 10.376} = \frac{0.1689 \text{ Mlb}}{\text{in}}$$

5.) Find number of bolts required for a load factor of 2

$$\text{Load Factor} = nL = 2$$

$$nL = \frac{S_{pA_t} - Fi}{C\left(\frac{P_{total}}{N}\right)}$$

$$N = \frac{(36) * (2) * 0.1689}{120 * (0.1419) - 12.771} = 2.8566 = 3 \text{ bolts obtained}$$

6.) Find the realized load factor for overload

$$nL = \frac{S_{pA_t} - Fi}{C\left(\frac{P_{total}}{N}\right)}$$

$$nL = \frac{120 * (0.1419) - 12.771}{0.1689 * \left(\frac{36}{3}\right)} = 2.10$$

7.) Find the yielding factor of safety

$$n_p = \frac{S_{pA_t}}{C\left(\frac{P_{total}}{N}\right) + Fi}$$

$$n_p = \frac{120 * (0.1419)}{0.1689 * \left(\frac{36}{3}\right) + 12.771} = 1.15$$

8.) Find the load factor for joint separation

$$n_0 = \frac{Fi}{\left(\frac{P_{total}}{N}\right) + (1 - C)}$$

$$n_0 = \frac{12.771}{\left(\frac{36}{3}\right) + (1 - 0.1689)} = 1.28$$

SUMMARY OF RESULTS

The analyzation of the bolts and the member specifications given by performing statistical analysis of various stiffnesses and load factors portray how the assembly needs at least 3 bolts to sufficiently support the weight of load caused by the installation of the other components. This is an inherent finding, as anything less than three bolts of the same graded material would cause a mounting failure within the desktop casing. This could lead to further damage within the system as the detachment of the motherboard due to the insufficient mounting failure could damage other components in the system. On the other hand, if the assembly process uses 4 bolts, then the assembly process will be safe as it will support the load applied on the extension of the bolts when fastened and assembled. Overall, this project allowed me to receive a further understanding of how extension loads on bolts interact in regards to clamping to materials members together in a real-life application.