L. B. Moroz

TECHNOLOGY OF OIL FIELD DEVELOPMENT

COURSE PROJECT

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

Ivano-Frankivsk National Technical University of Oil and Gas

Department of Oil and Gas Production

L.B. Moroz

TECHNOLOGY OF OIL FIELD DEVELOPMENT

COURSE PROJECT

Ivano-Frankivsk
2024

UDC 622.276
M-80

Reviewer:
Tarko J. B. Doctor of Technical Sciences, Professor of the Department of Oil and Gas Production, Ivano-Frankivsk National Technical University of Oil and Gas.

Recommended by the methodical council of the university
(Minutes № of , 2024)

Moroz L.B.
M-80 Technology of oil field development: course design. - Ivano-Frankivsk: IFNTUOG, 2024. - 35 p.

MB -2024

Course design contains methodological instructions for completing a course project in the discipline Technology of oil field development. Developed in accordance with the work program of the discipline.

Designed for students of the first bachelor's degree in higher education in the specialty 185 "Oil and Gas Engineering and Technology" of the educational professional program "Oil and Gas Production"

UDC 622.276

MB 2024

CONTENT

INTRODUCTION

Ukraine's oil industry has passed the period of maximum oil production, which is inevitably followed by a decline.

It is well known that Ukraine cannot fully provide itself with its own oil either today or in the future. Therefore, it is our duty to distribute the remaining oil reserves in Ukraine's subsoil for today and for future generations.

The use of oil and gas has a significant impact on the scientific and technological progress of our age. There is virtually no sector of the economy that does not use oil, gas and their products. The high level of annual oil and gas production in the world may lead to the rapid depletion of their reserves from the Earth's interior. Such fears are not unfounded: our planet's oil and gas reserves are certainly limited. Therefore, humanity faces the challenge of their rational and economical use.

However, not all of Ukraine's oil and gas reserves have been discovered to date. There are still large areas, mostly offshore, where new fields can be discovered. Great depths of the earth's interior are also insufficiently explored. This makes us optimistic about the further development of the oil and gas industry.

To intensify fundamental and applied research on the problems of rational oil well operation technology, including increasing their current oil productivity, taking into account the possible ultimate oil recovery from deposits, in order to create new methods of operation and

modernize the existing ones in terms of reducing production costs.

Since the extracted oil in the subsoil needs to be replaced with something (water, gas, air, residual oil, etc.), waterflooding is currently considered the most effective technology, although its negative consequences are known (environmental pollution, damage to the subsoil, man-made earthquakes); it is necessary to expand fundamental research on oil displacement by water under various schemes, improve technologies from the standpoint of economic efficiency, reduce the burden on subsoil and the environment; expand the use of waterflooding at economically viable facilities.

1 PURPOSE AND TASKS OF THE COURSE PROJECT

A course project is an important part of the educational process in a higher education institution. The course project in the discipline " Technology of Oil Field Development " is completed by students in the eighth semester. It is an integral part of the course and is carried out under the guidance of the teacher, the head of the course project. The course project is the student's first independent engineering work on solving oil field development issues.

The purpose of a course project is to complete a course project:

- consolidation of lecture material, deepening of knowledge and results of independent work of students in the discipline "Technology of oil field development" and related disciplines, obtained by students during their studies at the university;
- deepening and generalizing the knowledge gained by students in lectures, practical classes and other types of educational activities;
- acquiring skills of independent and creative work, the ability to work with special technical literature, standards, catalogs, technical instructions, etc;
- mastering the skills of performing complex engineering calculations using computers and preparing reporting documentation in accordance with existing requirements, followed by analyzing the results.

The design course develops the skills of performing technical calculations, building various diagrams, charts, and graphs, and drafting technical and economic notes.

During the course project, the student must demonstrate his or her erudition and ability to independently solve the tasks using the latest achievements in the theory and practice of oil field development and operation.

2 ORGANIZATION OF COURSE PROJECT

A course project is one of the elements of the educational process. It is an educational document that contains comprehensive, systematized information about the independent work performed by the student.

The course project is completed during the academic semester in accordance with the curriculum of the Oil and Gas Production specialty.

As a rule, the course project manager is appointed by the lecturer who teaches the lecture course, but other lecturers of the Oil and Gas Production Department, as well as specialists in this field from other institutions, can be appointed.

Individual course project assignments are given to full-time students by their supervisors at the beginning of the academic semester. Part-time students receive their course project assignments during the period of lecture preparation.

After issuing course project assignments, the supervisor familiarizes students with the general requirements for its implementation and design, draws up a calendar schedule for the implementation of projects by stages, indicating the deadlines and scope of individual stages. The supervisor informs students of the schedule of consultations, which are held at least once a week. During the semester, the teacher assigns two test weeks that correspond to the schedule for completing a particular stage.

The course project supervisor monitors the course project. If the student is significantly behind the calendar schedule without valid reasons, the department informs the director of the institute at the request of the supervisor, on the basis of which the student may be removed from the course project. During consultations, the supervisor checks individual parts of the project, points out methodological and technical errors in them, and recommends additional literature. During consultations, students find out specific issues that have arisen during the course project.

Although the course project is carried out under the guidance of a teacher, it should be remembered that it is not the teacher who designs, but the student. The task of the supervisor is to guide the student, suggest possible solutions to a particular problem, and note the positive and negative aspects of the proposed solutions. The course project manager is largely a consultant, and the student must make all decisions. The student is

responsible for the correctness of the decisions made, the correctness of their presentation, for all provisions, numerical values, and conclusions presented in his or her course project, and defends them when submitting it.

The completed course project contains an explanatory note and a graphic part, must be signed by the student and submitted to the supervisor for verification within the time specified in the project schedule, no later than 14 days before the end of the semester. A properly executed and formalized project is signed by the supervisor and is allowed for defense. Course projects are defended before a committee of 2-3 teachers with the direct participation of the course project leader and students of the academic group. The schedule for defending course projects is drawn up in advance. The composition of the commission and the schedule for defending course projects are approved by the head of the department. The defense is carried out no later than 7-10 days before the end of the semester. During the defense, the student makes a short (8-10 minutes) report on the work done and answers questions asked by the committee members. Questions are asked only by members of the committee; in some cases, with the permission of the committee, students present may ask questions. The student must be prepared to answer all questions on the topic of his or her course project. In the report, the student describes the task that was assigned to him or her, justifies the decision made, and presents the

final results. The course project is evaluated using a rating system.

3 TASKS FOR THE COURSE PROJECT

The topics of the course projects should correspond to the learning objectives of the course " Technology of oil field development ", contain real-world development problems to solve, taking into account an integrated approach and applying knowledge of related disciplines.

Course project assignments are developed by the supervisor, approved at a meeting of the department, and given to students at the beginning of the semester. The assignment specifies the topic of the project, the deadline for the student to submit the completed project, input data, a list of questions to be developed, the content of graphic material, and the schedule and deadline for completing individual sections. The assignment is signed by the course project manager and the student. At the end of the assignment, the date of its issuance is put.

Course project topics are diverse. Each element of the course can be the basis for a term project topic. Often, several students can be given one complex assignment. An approximate list of course project topics:

- basic hydrodynamic calculations of development indicators in the elastic regime;
- basic hydrodynamic calculations of development indicators in the dissolved gas regime;

- basic hydrodynamic calculations of development indicators in the hard-pressure regime;
- basic hydrodynamic calculations of development indicators during flooding;
- calculate the development indicators for the area flooding system;
- calculate the development indicators for a block flooding system;
- calculate the development indicators for contour flooding;
- calculate the development indicators for in-circuit flooding;
- studying the heterogeneity of productive formations;
- maintaining reservoir pressure by re-injecting water into the oil reservoir;
- maintaining reservoir pressure by re-injecting gas into the oil reservoir;
- development of an oil deposit with horizontal wells;
- forecasting the development of oil fields using displacement characteristics;
- forecasting the development of oil fields by flow rate per well day;
- gas methods of oil field development;
- thermal methods of oil field development;
- physical and chemical methods of oil field development;

- hydrodynamic methods of oil field development;
Also, course projects in the discipline " Technology of oil field development " can be united under the general title "Analysis of the development of _____ deposit _____ of an oil field and forecasting of technological indicators of development for the future period".

4 CONTENT OF THE COURSE PROJECT

The content of the course project must clearly correspond to the individual assignment for the course project, which is issued to each student.

The course project in the discipline "Technology of oil field development" consists of a calculation and explanatory note of 40-50 pages of A4 format and two sheets of graphic material (drawings) of A1 format in accordance with the assignment.

A calculation and explanatory note for a course project is a document that provides justification for the decisions made in the project. In the explanatory note, the material is placed in the following order (in general):

1) cover page;
2) course project assignment;
3) annotation;
4) content;
5) a list of basic designations, symbols and units of measurement;
6) introduction;

7) the main part, which is divided into sections, subsections, paragraphs, and subparagraphs in accordance with the course project assignment;

8) conclusions;

9) a list of references;

10) appendices (if necessary);

11) bibliographic reference.

The bibliography provides a list of textbooks, monographs, articles, reports, standards, industrial catalogs, price lists, dissertations, patents, and copyright certificates referenced in the explanatory note.

Applications usually include:

- intermediate mathematical formulas;
- tables of auxiliary digital data;
- identifier tables;
- printouts of machine programs on a computer;
- results of calculations on a computer;
- illustrations;
- technological maps;
- specifications and other documents.

When combining course projects with a common title in the main part, which is divided into separate sections and subsections, the following issues should be considered:

1. Geological and industrial characteristics of the field and deposit.

1.1. General information about the deposit.

1.2. Stratigraphy.

1.3. Tectonics.

1.4. Oil and gas water content. Objects of development.

1.5. Reservoir properties of formations.

1.6. Physical and chemical properties of fluids.

1.7. Hydrogeologic characteristics of the field and its natural mode of operation. Hydrothermodynamic conditions of oil occurrence.

1.8. Oil and gas reserves.

2. Analysis of reservoir development.

2.1. Brief history of exploration and development of the field.

2.2. Development design sequence and main provisions of the latest development document.

2.3 Analysis of actual reservoir development indicators. Comparison of design and actual development indicators.

2.4. Analysis of implemented methods of oil recovery enhancement.

2.5. Analysis of oil reserves production.

2.6 Analysis of the implemented development system.

2.7. Analysis of the existing reservoir pressure maintenance scheme.

Conclusions on the state of development of the deposit and recommendations for its improvement.

3. Hydrodynamic calculations in the elastic mode of development

3.1 Theoretical considerations of the elastic regime

3.2 Calculation of pressure changes in the oil pay zone

Conclusions.

4. Hydrodynamic calculations in the dissolved gas regime

4.1 Theoretical considerations for the dissolved gas regime

4.2 Determination of oil saturation at the end of the pressure change interval

4.3 Determination of development time

4.4 Determining the oil recovery factor

Conclusions.

5. Hydrodynamic calculations in a rigid pressure regime

5.1 Theoretical considerations of the hard-pressure regime

5.2 Determination of debit cards

5.3 Determining the development timeframe Conclusions.

6. Hydrodynamic calculations during flooding

6.1 Location of water injection wells

6.2 Determination of the total volume of water to be pumped

6.3 Determining the number of water injection wells Conclusions.

General conclusions.

The introduction provides a brief description of the current state and prospects for the development of the oil industry in Ukraine, neighboring countries, and the

world. Formulate the tasks of the course project and describe ways to solve them.

The first section of the course project provides general information about the field, the conditions of occurrence of productive horizons (deposits), the dates of discovery and commissioning of deposits, and initial oil and gas reserves. The composition and physical and chemical properties of oil, gas, and produced water are presented, usually in the form of tables and graphs.

In the second section, a table of technological indicators of reservoir development is required, and the dynamics of the main indicators of development over time is plotted. Also, an analysis of the implementation of oil recovery enhancement methods is carried out, indicating the date of implementation, the effect of the implementation, on the basis of which the most effective method is selected and then this technology of oil recovery enhancement is described in the form of an abstract. The following should be covered here: the scope of the technology; the physical nature of the process; the required reagents and preparation technology; and the process flow chart.

In the third, fourth, and fifth sections, we calculate the development indicators in relation to the hypothetical regime, i.e., assuming that the reservoir is developed under the elastic, dissolved gas, and liquid pressure regimes. In the first case, the pressure at the distance from the well, the pressure at the bottom hole is determined, using the superposition method to determine

the change in pressure at the bottom hole: a) the first well at the time of the second well; b) the first and second wells at the time of the third well; c) the first, second and third wells at the time of the fourth well one month after the fourth well. In the second case, the oil saturation at the end of the pressure change interval is calculated (Zinovieva's method), oil recovery factors and development time are determined. In the case of a hard-pressure regime, well flow rates and development time are determined.

The sixth section calculates the process of oil displacement by water, namely, the volume of injected water, the pressure at the bottom of the injection well, the acceptability of one well, the number of water injection wells, the development time, and the requirements for injected water.

The general conclusions summarize the main results obtained by the student personally in the course project.

The content of the other course projects is similar and also includes an introduction, an overview, a calculation part, conclusions, and drawings.

5 METHODICAL INSTRUCTIONS FOR THE IMPLEMENTATION OF THE COURSE PROJECT

After receiving the assignment for the course project, the student draws up a detailed plan (content) of

the course project and the sequence of implementation, indicating the calculation dependencies and formulas.

When drawing up a plan for solving the problem set in the assignment, it should be presented as a set of separate subdivided tasks. All issues must be addressed in a clear logical sequence: theoretical statement of the problem; specification of input data; choice of a solution method; selection or derivation of the necessary formulas; description of notations not specified above; substitution of numerical values; calculation results; analysis of the results; conclusions.

After receiving the first results, it is advisable to meet with the course project supervisor and familiarize him or her with the list of selected literature and your thoughts on the task.

Today, there are various methods for solving many oil field development problems. Each method is based on certain assumptions and has certain advantages and disadvantages. Therefore, when completing a course project, it is necessary to justify why a particular method or calculation formula is used.

Before starting the actual calculations, you should once again clearly understand what is being set, what needs to be determined, and what values should be set. Acceptance of additional input data requires familiarization with additional literary sources and other material. All of this develops the student's ability to analyze and compare quantitative quantities or parameters.

When performing a course project, the main calculations should be carried out on a computer. During the calculations, you should check intermediate calculations, compare and analyze the resulting values in order to prevent errors.

Ignorance or confusion of units of measurement is one of the most common mistakes when completing a course project. The values of physical quantities used in the course project should be given in the dimensions of the international system of SI units: pressure - *P*, Pa; dynamic viscosity coefficient - μ , Pa·s; reservoir piezoconductivity coefficient- χ, m^2/s; reservoir permeability coefficient - k, m^2 ; well flow rate - Q, m^3/s, etc. At the same time, it is allowed to use non-system units, for example, oil flow rate measurement – m^3/day, t/day; pressure - MPa, etc.

The text of the course project should be written in the state language, correct in terms of spelling, lexicology (the science of correct word choice), stylistics (the science of correct sentence construction), and technical terms and definitions. All linguistic expressions should be concise, clear and not subject to double interpretation.

It is not permitted to rewrite descriptive material from books without their independent processing, as well as analytical expressions and other information without reference to the relevant source of information.

6 GENERAL INSTRUCTIONS FOR THE DESIGN OF THE COURSE PROJECT

The course project consists of a calculation and explanatory note and a graphic part.

The calculation and explanatory note is a technical document and is drawn up in accordance with the "Recommendations for the preparation of manuscripts of educational and methodological literature for publication at the Ivano-Frankivsk National Technical University of Oil and Gas. - Ivano-Frankivsk, 2010. - 87 p." and "STP 02070855-03-99. Enterprise standard. Course and diploma projects. Requirements for content and design".

The title page is drawn up on an A4 letterhead made by printing and filled in by the student with black ink in a drawing font or black typewriter.

Samples of the cover sheet and course project assignment are provided in Appendices A, B. The cover sheet and course project assignment must be signed by the student. The course project assignment form is filled out on one sheet of paper on both sides.

The abstract, which should not exceed half a page (no more than 500 words), should contain a brief summary of the work. The abstract can be written in Ukrainian and, at the student's choice, English, German or French.

The table of contents should include the titles of all sections, subsections, paragraphs, and subparagraphs, along with the page numbers of their respective pages.

The settlement and explanatory note shall be prepared on separate A4 sheets of white paper. All sheets, except for the annotation, have a frame with the main inscription (stamp). The word "Table of Contents" is placed in the middle of the page with a capital letter. The "Table of Contents" of a course project, depending on its structure, may be located on several pages, with the main inscription (stamp) on the first page of the "Table of Contents" being full (40 mm high), and the rest of the pages of the explanatory note being reduced (15 mm high). The abstract should be drawn up without a frame and the main inscription (stamp).

The explanatory note should be typed in Word for Windows text editor in 14-point font at 1.5 intervals. Recommended margins: top - 15 mm; bottom - 30 mm; left - 30 mm; right - 10 mm.

Typos, spelling errors and graphic inaccuracies found in the explanatory memorandum may be corrected by erasing or using a special corrector, followed by applying the corrected text in the same place.

Damage to the sheets of the explanatory note, dirt, and traces of incompletely removed previous text are not allowed.

The explanatory memorandum must have a hard cover (made of thicker paper than the sheets of the explanatory memorandum). A non-white label made of

white paper 120 x 80 mm in size is affixed to the cover, on which the title of the document, the abbreviated name of the specialty, the last two digits of the academic record, the academic group designation, the student's name, surname, and the year of the work are indicated in black ink in a drawing font or typewriter.

The material of the memo should be presented clearly and concisely, but without compromising the clarity of the presentation. Abbreviations of words and units of measurement of physical quantities are not allowed, except for generally accepted ones. Abbreviated designations of units of measurement are allowed only after the quantitative values to which these designations relate. For example, 10 thousand pieces, 25 million UAH, etc. Each new thought in the text should begin with a paragraph.

The text of the explanatory memorandum is divided into sections, subsections, paragraphs and subparagraphs, which are numbered. The introduction and conclusion are not numbered. Each section should be started on a new page. Sections are numbered throughout the explanatory memorandum and are indicated by Arabic numerals without a period. Subsections (paragraphs, subparagraphs) are numbered within each section (subsection, paragraph). The subsection number consists of the section number and the subsection separated by a dot (for example, 2.1 - first subsection of the second section). No period is placed at the end of the subsection number. Paragraphs and subparagraphs are numbered in

the same way (for example, 3.2.1 - first paragraph of the second subsection of the third section; 4.1.3.2 - second subparagraph of the third paragraph of the first subsection of the fourth section).

The title of the section (subsection, paragraph, subparagraph) should be short, correspond to the content and assignment for the course project. The title of the section is placed symmetrically to the text, and the names of the subsection, paragraph, and subparagraph - with a paragraph indent. The titles of sections are written in uppercase (capital) bold letters, subsections - in lowercase subparagraphs - in lowercase letters. No hyphenation is allowed when writing section titles, no underlining of titles and no placing them as the last line on the page of the explanatory note. The distance between the title of the section, subsection, paragraph and the following text should be two intervals, between the title and the previous text - three intervals. The title of the subparagraph is indented, and the subsequent text is placed on the same line after the title.

The numbering of the pages of the explanatory memorandum should be through (without gaps, repetitions and addition of letters). Pages with tables and illustrations placed on separate sheets are included in the general page numbering of the explanatory note. The first sheet of the explanatory note is the title page, the second, third - assignment for the course project, and the fourth - (small) bold letters, paragraphs, abstract. They are not

numbered, but are included in the general page numbering. Thus, the first page of the "Table of Contents" for a term project is the 5th page in the through page numbering, and its number is indicated in the corresponding column of the main inscription (stamp).

All illustrations and tables are numbered with Arabic numerals within the chapter. The number of an illustration (table) consists of the section number and the ordinal number of the illustration (table), separated by a period. For example, Figure 2.9 - is the ninth figure of the second section; Table 4.5 - is the fifth table of the fourth section. Within a section, the numbering of tables, formulas, and figures included in it is through, i.e., without taking into account the number of subsections, paragraphs, and subparagraphs. The number and title of the illustration are placed below it symmetrically to the page frame. The word "Figure", the number of the illustration, a dash, and its title are capitalized. If necessary, place explanatory data below the figure. In this case, the figure number and title are given after them. For example, "Figure 1.1- Title of the figure".

The table number and title are placed above it on the left border of the frame. The column "Number in order" is not allowed to be included in the table. The rest of - is similar to the requirements for illustrations. In case of transferring the table to another page (or line), write near the left border of the frame: Continuation of Table 4.5. In this case, the names of the individual columns of the

table header may be omitted, indicating only their serial numbers. For example, "Table 1.1 - Table Title".

When referring to a figure or table for the first time in the text, write "Fig. 2.1" or "Table 4.5"; when referring repeatedly, add the word "see", for example, (see Fig. 2.1) or (see Table 4.5).

Figures and tables should be placed immediately after the first reference to them in the text of the note. It is advisable to place the figure (table) on the page so that it can be viewed without turning the note, with the illustrations (tables) in landscape format - with its clockwise rotation.

When preparing the textual part of the explanatory note, do not write "accept", "assume" . The note should be written using first-person plural verbs, for example, "accept", "assume" or in the impersonal form "accepted".

The order in which the calculations are presented in the note is determined by the nature of the values to be calculated.

In general, the calculation should include:

1) the task and conditions of the calculation (indicating the values and parameters to be determined);

2) input data for the calculation with the names of quantities, their symbols and units of measurement;

3) calculation methodology and algorithm;

4) a calculation or example of a calculation in a multivariate problem solving or calculation of "control points" if a computer is used;

5) analysis of the calculation results and conclusions.

Number formulas with Arabic numerals in parentheses in the same line as the formula on the right (near the right border of the frame). The formula number consists of the section number and the ordinal number of the formula in that section, separated by a period.

References in the text to the serial numbers of formulas are given in brackets, for example, it follows from formula (4.2) that.

If an equation (formula) does not fit in one line, its part is moved after the equal sign (=) or after the arithmetic signs (+), (-), (□) or (:), ending the first line of the formula with one of these signs and starting the second line with it.

The interpretation of the values of the symbols included in the formula should be given directly below the formula in the sequence in which they appear in the formula. In this case, they should be written on a new line, separated by a ";". The first line of the decoding begins with the word "where" without a colon, in which case a comma is placed after the formula. When performing calculations according to the above formula, immediately after decoding the designations of all quantities, write down their numerical values. Then they are substituted into the formula and the desired value is calculated. Numerical values are entered into the formula without dimensions. Intermediate calculations are not written in a specific analytical expression. The final

result is written with the dimension of the calculated value.

If the calculated result is a very large or very small number, the multiplier - 10 with the appropriate exponent is used when writing it. For example, according to the calculations of a=18273961, the result is written as $a=18.27\cdot 10^{6}$; or, similarly, b=0.003971 is written as $b=3.97\cdot 10^{-3}$. When presenting the calculated result in the form of a product by a factor x 10 with the appropriate exponent, its integer part should contain no more than 3 digits, and the fractional part (after the decimal point) - no more than 2.

If the formula is used again in the subsequent text of the note, the decoding of its symbols is not provided.

When using empirical formulas, as well as formulas that are not commonly known in this course, you must provide a link to the relevant literature source.

References in the text to literary sources are made using square brackets, which indicate the serial number in the list of references. For example, "a solution method is proposed in [2]." Then, under number [2] in the list of references, the corresponding source is indicated, which is written in the following order: author's name, initials, title of the textbook or other source of information, publisher, year of publication, number of pages. For example:

Boyko V.S. Technology of oil field development: Textbook. - Ivano-Frankivsk: Nova Zorya, 2011. - 509 p.

When quoting from sources, you should indicate the page number, for example, [2, p. 70].

Appendices are made if necessary. They should be prepared as a continuation of the document, placed in the order of references to them in the text. Each appendix starts on a new page. Appendices are indicated by capital letters of the Ukrainian alphabet, starting with A, except for the letters D , E, F, G, I, J, O, Ch, B. Illustrations, tables, formulas contained in the appendix are numbered within each appendix, for example, Figure A.1, Table B.2, formula (B.3).

The last sheet of the explanatory note is a bibliography, which indicates the total number of pages, figures, tables, sources of information used, applications, and the amount of graphic part of the course project.

On the last page of the explanatory note, the student signs and dates the end of the course project.

The explanatory note is accompanied by two drawings of the graphic part of the project, which are made on standard A1 sheets in compliance with the relevant applicable standards. The content of the graphic part of the course project is assigned by the course project manager individually for each student in accordance with the topic of the course project. The graphic part is performed in ink or on a computer. If the graph shows several lines (curves), then a different color or different outline is used for each of them. In this case, an explanatory inscription is made at the bottom of the graph.

The main inscription (corner stamp) of the established form (55 x 185 mm) is made in the lower right corner of the drawing. The graphic part in the appropriate columns of the main inscription is signed by the student and the course project supervisor with the date.

7 WORKING WITH LITERARY SOURCE

When completing a course project, you must use literary sources. As a rule, the main literature is indicated in the course project assignment. Additional literature should be selected by yourself from the library (subject and alphabetical) catalog or on the Internet. In most cases, specialty journals publish a list of articles published during the year. Each article also has references to literary sources that should be used in the project. For the successful completion of the project, the student needs to familiarize himself with periodicals, first of all, with refereed journals, which publish abstracts of articles published on the subject in various technical journals. It is also advisable to familiarize yourself with the collection of research papers of research, design and educational institutes.

LIST OF RECOMMENDED REFERENCE

1. Boyko V.S. Technology of oil field development: Textbook. - Ivano-Frankivsk: Nova Zorya, 2011. - 509 p. - ISBN 978-966-398-062-1.
2. Technology of oil and gas production, storage and transportation: Textbook / [O.I. Akulshyn, O.O. Akulshyn, V.S. Boyko, et al. - Ivano-Frankivsk: Fakel, 2003. - 434 p. - Bibliography: p. 429 - 431. - ISBN 5-11-00081-3.
3. Boyko V.S. Development and operation of oil fields: Textbook - 4th supplemented edition. - K.: International Economic Foundation, 2008. 488 p. - ISBN 978-966-96506-6-5.
4. Handbook of Oil and Gas Business / Edited by Doctors of Technical Sciences V.S. Boyko, R.M. Kondrat, R.S. Yaremiychuk - K. : Lviv, 1996. 620 p. - ISBN 5-335-01293-5.
5. Recommendations for the preparation of manuscripts of educational and methodical literature for publication at Ivano-Frankivsk National Technical University of Oil and Gas. - IFNTUOG, 2010. - 87 c.
6. STP 02070855-03-99 Course and diploma projects. Requirements for content and design. - IFNTUOG, 1999. - 72 c.
7. Volchenko D. O., Dragan I.M. Technology of oil field development: a workshop: Ivano-Frankivsk: IFNTUOG, 2017. 84 p.

8. Technology and design of oil field development. Collection of tasks / V. S. Boyko, D. O. Volchenko, I. M. Dragan - Ivano-Frankivsk, 2016. 84 p.

Appendix A

Ministry of Education and Science of Ukraine
Ivano-Frankivsk National Technical University
Oil and Gas

Department of oil and gas production

COURSE PROJECT

in the discipline "Technology of oil field development"

Topic: **"Basic hydrodynamic calculations in different development drives"**

EXPLANATORY NOTE
CP.NIV-55.00.00.000 EN

Oleg Shkromyda, student of NIV-21-1 group

Course project manager Dr. Lesia MOROZ

2024

Appendix B

Ministry of Education and Science of Ukraine
Ivano-Frankivsk National Technical University of Oil and Gas
Department of Oil and Gas Production

"APPROVED"
Head of the Department of Oil
and Gas Production
assoc. prof. Lilia Matiyishyn
2024 p.

TASKS
for a course project in the discipline
"Technology of oil field development"
for students of gr. NIV - 21-1 in the spring semester
2024/2025 academic year

Topic "Basic hydrodynamic calculations in different development drives"

№ n/a	**Section titles**	**Deadline for completion**	**Rating (points)**
1.	Introduction. Geological and industrial characteristics of the field and deposit. Analysis of deposit development.	27.02.25 y.	10(10)
2.	Hydrodynamic calculations in elastic mining mode	05.03.24 y.	20(30)
3.	Hydrodynamic calculations in the dissolved gas regime	20.03.24 y.	20(50)
4.	Hydrodynamic calculations in the hard-pressure regime	15.04.24 y.	20(70)
5.	Hydrodynamic calculations during flooding	27.04.24 y.	20(90)
6.	Preparation of an explanatory note to the course project and graphic appendix (posters). Presentation of the course project for defense	07.05.24 y.	10(100)

The initial data and the content of the course project sections are attached.

The task was prepared by Associate Professor Lesya MOROZ

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Explanatory note to the course project in the discipline
Oil field development technology
on the topic "Basic hydrodynamic calculations
in different development drives"

5. Hydrodynamic calculations in the hard-pressure regime
   5.1 Theoretical considerations of the hard-pressure regime
   5.2 Determination of debit cards
   5.3 Determination of development time
   Conclusions
6. Hydrodynamic calculations during flooding
   6.1 Location of water injection wells
   6.2 Determining the total volume of water to be pumped
   6.3 Determining the number of water injection wells Conclusions.
   General conclusions
   List of references

The explanatory note shall be accompanied by 2 sheets of graphic drawings in A1 format for graphical dependencies arising from the assignment, flow charts.